



HOLMES SACKETT



# final report

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## **Assessment of the economic impact on stakeholders and industry from extending the lamb definition**

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## Executive Summary

- The objective of this report is to assess the likely economic impact of a change in the Australian definition of lamb from before eruption of the first permanent tooth to either:
  1. two teeth not in wear (approximately 30 days older than the current definition); or
  2. two teeth in wear but before the eruption of the third permanent tooth (approximately 10 months older than the current definition).
- The net economic impact of a change to either proposed definition was assessed by estimating the following.
  1. Changes in cost of production for sheep producers, lamb finishers, live sheep exporters and sheep processors of either proposed change to the definition of lamb.
  2. Changes in supply, demand and equilibrium prices for lamb, mutton and wool caused by changes in cost of production under the existing sheep industry structure (therefore excluding any impact of adoption or lack of adoption in the industry).
  3. Potential impacts on cost of production for processing of the implementation of Sheep Meat MSA systems in order to protect eating quality under the extension of the definition to two teeth not in wear.
  4. Potential impacts of non-compliance to the current definition (substitution of mutton for lamb) and how this might erode benefits from an extension to the definition of lamb if that led to increased substitution.
  5. The potential risks to any potential net benefits from lack of adoption by industry, increases in non-compliance or increases in consumer dissatisfaction with eating quality.

### ***Two teeth not in wear***

- There is a potential \$20 million dollar net benefit to the lamb industry from receiving a higher value for product that misses out on being graded as lamb under the current definition because of the eruption of the first permanent tooth. This benefit will primarily be attained by lamb producers, finishers and processors.
- The major risk identified with an extension of the definition of lamb to two teeth not in wear was that it would lead to increased substitution because the boundary between lamb and mutton was not as easy to identify. This was supported by the fact that >75% of key customers surveyed said they would not accept any change in the definition of lamb because they were concerned about product quality.

- The impact of 5% substitution of mutton for lamb is a net loss to the industry of \$30M as a result of lower prices paid for lamb which is partially offset by higher prices for mutton and direct benefits to processors that are substituting.
- The risk of increases in substitution is therefore considered to outweigh the benefits of a change in definition to two teeth not in wear.
- Under the assumption that there is 5% substitution of mutton for lamb under the current definition for lamb and that the industry could effectively regulate this for less than \$10M then the industry has as much to gain from effective enforcement of the current definition. This would then eliminate the risk to a change in definition to two teeth not in wear.
- It is recommended that action is taken on the regulatory environment with regard to ensuring no substitution takes place before a change in the definition of lamb to two teeth not in wear is considered.

### ***Two teeth but before the eruption of third permanent tooth***

- The net economic benefit for the sheep industry (from producers through to customers) of a change in the definition of lamb to two teeth but before the eruption of a third permanent tooth is estimated to be \$79.2M. This benefit is attained solely from revaluing animals currently sold as hoggets, as lambs – i.e. existing sheep sold after the eruption of the first permanent tooth but before the eruption of the third permanent tooth (approximately 1-2 years of age). There is no change assumed to the current industry flock structure and in particular no change in the wool industry to flock structure and age at sale of surplus sheep.
- This net economic benefit is not simply retained by sheep producers – it is predominantly attained by overseas customers of wool (\$31.5M) because of a significantly lower cost of production of wool and therefore lower price. The wool industry retains a \$29.6M benefit mainly through increased value of existing hogget sales. This is partially offset by -\$1.5M loss to dual purpose producers with prime producers gaining \$0.2M.
- Sheepmeat processors and exporters only stand to gain \$0.9M from a change to this definition.
- The major risk identified is the likely increase in consumer dissatisfaction with a change to this definition. This is supported by the fact that there was essentially no support for this change in definition by key customers, with the exception of those that are primarily price focussed, and they still qualified their support as being dependent on maintaining eating quality.
- Where MSA sheep meat standards are not in place the increase in consumer dissatisfaction with eating quality could increase seven fold from 5% to 35% (Pethick pers. comm.). In a situation where MSA sheep meat standards are adhered to the increase in consumer dissatisfaction would be threefold from 5% to 15% (Pethick 2008).

- It is estimated that implementation of MSA sheep meat quality assurance programs in the processing industry would cost between \$0.02 and \$0.07 per kilogram and would thus offset approximately 35% of the potential net economic benefit. It would therefore require only a 2.5% drop in demand for lamb (as a result of three times the consumer dissatisfaction) to offset any residual benefits.
- The extension to the definition of lamb to two teeth but before the eruption of a third permanent tooth is therefore not recommended on the basis that the risks from a reduction in demand as a result of a decrease in eating quality are likely to at a minimum offset the gains to the wool industry and its overseas customers and would most probably reduce overall industry profitability.

## Introduction

The purpose of this study is to examine the economic impact of changing the definition of lamb from its existing definition – before eruption of first two permanent teeth – to one of either two amended definitions:

1. Up to two teeth erupted but not in wear.
2. Two teeth erupted but no eruption of the third permanent tooth.

The first amended definition has no known eating quality implications, whilst the second definition is known to increase consumer dissatisfaction with eating quality from approximately 5% to 15% where all MSA sheep meat systems are adhered to (Pethick 2008).

The economic impacts of changing the definition of lamb for the industry are assessed by surveying industry participants from key customers back through the chain to processors, live exporters, finishers and wool and lamb producers.

The surveys were designed to capture how each sector of the industry might respond to the change in the definition. A combination of marginal costing, production system modelling, and industry modelling was then used to quantify the impacts of those changes both at the individual enterprise level and at the whole industry level.

The outcomes of this project will:

- Help provide some objective means by which the industry can assess the balance between costs and benefits to the whole industry.
- Assist the industry to better understand what impacts the changes in definition are likely to have across the national sheep flock as the producers shift emphasis between the key products (lamb, mutton and wool) based on the relative economic merits of each.

A key component of this work is the marginal impact of the responses and also the effects on flock, lamb finisher, live exporter and processor profitability.

This project does not attempt to identify individuals within any part of the supply chain that might win or lose as a result of a change in the definition of lamb but rather looks at each part of the supply chain as a whole. This is an important point for the reader to understand, as there might be individuals within a particular part of the supply chain that is deemed to

derive a benefit as a whole, that would be worse off under a changed definition or vice versa.

This study is intended to broadly look at the responses for a number of enterprises and a number of regions so it is beyond the scope of the project to look at each possible scenario in complete detail. It is intended to complement other recent work on the extension of the definition of lamb.



## **Methodology**

### ***Background Review***

A background review of key information in relation to this issue was done prior to survey and modelling work commencing. The specific areas that this review covered were;

1. Impacts on sheep meat eating quality.
2. Non-compliance costs within the industry.
3. A review of MSA guidelines for sheep meat and their costs to processors.
4. A review of lamb definitions in other countries.

### ***Industry Surveys***

Surveys of key industry participants were conducted predominantly via interview. Survey questions were a mix of specific questions to capture key details of the existing systems and deliberately open ended questions to capture the individual's response to changing the definition. It was not expected that the individual would necessarily know the economic impacts of their decisions (this is quantified through modelling) but their responses were used as a guide as to where and what modelling needed to be done to capture their responses.

Survey questions are included as an Appendix to this document.

### ***Marginal costing***

Some sectors of the industry will see straight forward shifts in their cost base as a result of a change in the definition of lamb. An example is the scenario's where a percentage of lambs would normally be discounted as mutton having had their first permanent tooth erupt, an extension of the definition may avoid this cost. The change in cost can then be attributed directly to the individual sector and the change in supply as a result is determined from industry modelling.

### ***Sheep production systems modelling***

Spreadsheet models of sheep flock production systems are used to estimate the impact of changes in supply and cost of production of lamb, mutton and wool as a result in changes to the definition of lamb. The production system models used are stochastic. The primary assumption is that the farm area allocated will carry a fixed winter DSE equivalent of sheep and therefore production is limited by the cap in stocking rate.

## **Industry modelling**

A detailed Equilibrium Displacement Model (EDM) of the Australian sheep and wool industries described in Mounter et al. (2008a) is used to estimate, where possible, the potential annual industry returns from changing the definition of lamb. This more complex model, rather than a simpler lamb industry model specified in the DREAM software format (as described in Griffith et al. (2006)) was considered necessary because of the complex inter-sectoral issues arising from the proposed change in definition.

The partial equilibrium framework of the EDM involves linear approximation of changes in prices and quantities of inputs and outputs. In this approach the industries are represented by a system of demand and supply relationships for all of the inputs and outputs specified in the model. Base prices and quantities for a typical year are used to define an initial equilibrium. Any external changes to the system are modelled as a shift in demand or supply from that initial equilibrium. These initial shifts represent incentives to change behaviour and result in subsequent adjustments in prices and quantities in all related markets, over some period of time (typically specified as “medium-term”, or 3-5 years). From the resulting changes in all market prices and quantities, the changes in “producer surplus” and “consumer surplus” can be calculated as a measure of the changes in annual economic benefits accruing to the various industry sectors. These changes in “surplus” are calculated using standard formulae (Mounter et al. 2008a)<sup>1</sup>. The model has been peer reviewed and used in a number of published industry applications (Mounter et al. 2008b,c; Mounter, Griffith and Mullen 2008).

## **Producer Survey Results**

A total of 67 producers were surveyed for their likely response to a change in the definition of lamb. A summary of the answers is shown below.

### **Prime Lamb Producers**

A total of 25 prime lamb producers were surveyed running a combined total of 80,243 ewes. Prime lamb producers are those that have production systems set up that target the majority of their income (~80% or greater) from lamb production. They include specialist sheep meat genetics in either self replacing or purchased replacement systems.

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<sup>1</sup> Producer surplus is a measure of economic benefit to producers as a group. It is defined as the difference between willingness-to-accept a price for their product and the price actually received, summed across all producers. Here, producers are sheep and wool producers as well as producers of all intermediate products. Consumer surplus is a measure of economic benefit to consumers as a group. It is defined as the difference between willingness-to-pay a price for a product and the price actually paid, summed across all consumers. Here, consumers are final consumers.

The average flock size was 3,210 ewes, ranging from 1,000 up to 10,000 ewes. A combined total of 90,428 lambs were sold by these flocks with the average 3,768 lambs. The greatest number of lambs sold by an individual flock was 11,000 lambs and the least was 1,190 lambs. The average flock size of the producers surveyed is much larger than industry average of 1,478 for 2007-08, indicating the sample represents larger than average and professional prime lamb producers.

A total of 84% of flocks indicated that their main lambing month was between June and September and all flocks lambed somewhere from March to October. The average target market weight was 21 kilograms dressed weight, ranging from the equivalent of 17 kilograms dressed weight store lambs up to 28 kilogram finished lambs. A total of 76% of producers indicated that their target sale weight was between 20 and 22 kilograms dressed weight.

The least amount of time taken by individual flocks to achieve target sale weight with the majority of lambs was 4 months (target market is store lambs) and the maximum 12 months. For all flocks, the average age when the majority of lambs achieved the target sale weight was 6.8 months. 88% of the flocks surveyed indicated that the majority of lambs achieved their target sale weight by 8.5 months of age (inclusive of store lamb sales).

A total of 78% of lambs sold as a finished product from specialist prime lamb flocks are sold well before 12 months of age and are not at risk of cutting their teeth before they are sold.

A total of 21% of the flocks surveyed indicated that all of their lambs were sold as stores, 41% of flocks sold some lambs as store lambs, whilst 38% of flocks indicated that they did not sell any of their lambs as stores. Of those that sold some lambs as stores, the average percentage was 28.1% of total lambs sold.

The number of lambs sold as stores from the survey results is higher than that indicated by NLRS saleyard data which indicates that in the last three years 20% of lambs through saleyards have been store lambs with an end destination of either finishing systems or as replacement breeders (ewe lambs) or wool cutters (wether lambs). It is not possible to discern what proportion of this 20% went to finishing systems. The survey results of specialist prime lamb producers may reflect a trend towards store lamb production systems.

Of those lambs sold as stores, respondents indicated 99% were sold less than the maximum age to allow finishers to have them finished before 12 months of age. This was deduced by adding the age at sale of store lambs to the average time on feed in specialist finishing systems.

These results again indicate that only a minority of lambs sold from specialist prime lamb production systems are at risk of cutting their teeth before they are sold. This is reflected in stated opportunities to a change in the definition of lamb to two teeth not in wear.

### **Opportunities of two teeth not in wear definition**

Few of the prime lamb producers surveyed saw any opportunities for their systems from a change in definition to two teeth not in wear except those selling tail end lambs up to 14 months of age who perceived a benefit in fewer being sold as hogget (This represented 8% of producers). The stated opportunities from a change in definition to two teeth not in wear were;

- “Would help a lot in our system. It doesn't make much sense when we draft a mob of lambs from the same drop and some have cut their teeth and some haven't, but of course we get a discount for those which have cut their teeth, and I'm convinced that the abattoir would be selling them as hoggets. It would take the pressure off and get the 5% over the line.”

A more common response to the extension of the definition of lamb was:

- “No benefit unless constantly monitoring dentition such as in a feedlot. If unable to finish before current age another month will not help that much.”

Some prime lamb producers could see that an extension of the definition up to two teeth erupted but not in wear could benefit them in a reduction in their ewe numbers with lambs traded in their place, as there is the potential to buy and finish older lambs with less risk. In other words it was perceived that it would create finishing opportunities. This however would not lead to any change to the current management system, rather a change to the enterprise mix on the farm.

### **Opportunities of two teeth but before the eruption of the third permanent tooth**

The stated opportunities from a change in definition to two teeth but before the eruption of the third permanent tooth were;

- “If season prevails it would give us the opportunity to carry our tail end lambs through and finish on grazing crops.”
- “The only advantage is that we could then sell ewe hoggets as lamb if we didn't join them or if they failed to conceive”.

The responses were however more heavily skewed towards there being no opportunities for prime lamb production systems from an extension of the definition of lamb to two teeth but

before the eruption of the third permanent tooth. Responses typical of the responses received were:

- “All of my lambs are sold between 6 and 7 months of age. Our season does not allow us to carry them through unless we have a summer crop and they have proven to be risky i.e. expensive.”
- “Not a great option. It would reduce the consistency and quality of the lamb product unless it was branded in a different way.”
- “None, there aren’t any efficiency gains to be had from taking lambs through another season.”
- “No effect on my current system, but depending on the margins could revert to trading more and running less wet ewes.”

### **Threats from a change in the definition of lamb**

The majority of prime lamb producers surveyed perceived a threat from a change in definition, particularly if it were changed to two teeth but before the eruption of the third permanent tooth. The assumption was that this would result in an inferior product which would lead to consumer dissatisfaction. This ultimately would result in reduced demand and a subsequent decrease in the price for lamb. Others were concerned that increased supply would reduce the lamb price leading to a reduction in the profitability of their systems. The stated threats from a change in definition were:

- “I think, on reflection, that the status quo should prevail. Australia has a reputation for high quality lamb, particularly in the Asian and USA export markets. To broaden the definition of lamb will probably mean a potential decrease in quality. I understand why merino breeders need more time to finish their lambs, but this may be to the long term detriment of the industry.”
- “Adverse consumer effects and consumer confusion.”
- “Increased supply and decreased quality to the consumer will reduce price and reduce our profitability.”
- “Reduced quality. Can be seen as a disincentive to prime lamb producers to improve efficiency and size. More profitable to grow lamb to saleable weight in 5 months than waiting until 22 months.”
- “Lamb eating quality and subsequent consumer dissatisfaction could reduce demand.”

- “Reduced eating quality, increased supply of lower grade product and the potential loss of markets.”

It is clear therefore that the majority of prime lamb producers would feel threatened by an extension of the definition of lamb to two teeth but before the eruption of the third permanent tooth because they foresee negative impact on price without any significant advantage in their breeding systems.

A minority of others were less concerned about any downside to their business and under the provision that eating quality was not adversely affected could see some industry benefits from evening out supply. Two responses that showed qualified support are shown below;

- “I think quality of product is the criteria, and if it can be shown that there is little problem in this area, then price should not be affected. It should mean there is more orderly marketing.”
- “Can't really see any threats. I think it will shore up supply throughout the year. More numbers but hopefully export markets could absorb the increase.”

The overwhelming response from prime lamb producers is that the negatives of an extension to the definition of lamb to two teeth but before the eruption of the third permanent tooth would outweigh any positives from being able to get more lambs finished before they fell outside the current definition.

Some prime lamb producers responded by indicating they would look at shifting away from prime lamb production to incorporate a lamb finishing system (trading lambs) into their enterprise mix as a means of trying to capture some benefit.

There was less opposition to a change in the definition to two teeth not in wear and some support because it would allow lambs that currently fall outside the existing definition of lamb to be sold as lamb when it is perceived that there would be very little difference in product quality.

From the surveys it was identified that 8% of prime lamb producer's carry tail end lambs (assumed to be 20% of the total drop) to an age where they are at risk of cutting their teeth and 5% of those tail end lambs do cut their teeth before they are sold. This represents 0.08% of specialist prime lamb production.

It is not surprising then that all prime lamb producers surveyed suggested that they would not change their prime lamb production system as a result of a change in the definition of lamb.

The reason offered was that their production systems are currently designed to optimise profitability with the majority of lambs before 8.5 months of age.

The prime lamb production systems surveyed are set up to utilise the main growing season for the year. In most instances the lambs are born between 1 and 4 months before the spring growing season with the aim of selling them in the weight ranges previously mentioned of between 17 kilogram dressed weight as store lambs and up to 28 kilograms dressed weight as heavy slaughter lambs. These producers could not see a significant enough advantage in changing the definition of lamb that would allow them to operate a more profitable system.

Because no changes in system were suggested none have been modelled for comparison under either proposed new definition of lamb. Given the very small percentage of specialist prime lamb that is affected by teeth erupting before sale (0.08% of total lambs) there is not a recognisable shift in cost of production of lamb or wool across the industry and therefore it is not expected that there would be a substantial supply or demand shift. The cost to the industry is therefore quantified as a marginal cost. This is reported in the chapter on industry modelling.

### ***Dual Purpose Producers***

A total of 23 dual purpose producers were surveyed and were drawn from various regions of Western Australia, New South Wales, Victoria and Tasmania. Dual purpose producers were defined as those using dual purpose breeds or those that used a non-merino sire across some or all of their merino ewes. This group of sheep producers have production systems set up to generate returns out of both meat and wool.

A total of 130,226 ewes, 16,000 wethers and 39,800 hoggets were represented by these flocks. The average flock size was 5,662 ewes, 889 wethers and 1,809 hoggets. The flock structures represented show that they are already ewe dominant in order to try to capture the benefits of meat and wool income.

All flocks indicated that their main lambing month was between May and October, with 91% of the flocks surveyed lambing between June and September. The combined total of lambs sold by the flocks was 41,155 with the average selling 2,325. The greatest number of lambs sold by an individual flock was 7,000 lambs with the least number sold 150, from 8,000 and 2,300 ewes respectively. Lambs were sold from 3 months of age as stores up to 14 months of age as finished lambs.

A total of 43% of flocks sold all of their lambs as stores and these lambs accounted for 47% of the total number of lambs sold. Of those that sold all of their lambs as stores they sold them at 4 months of age.

From the surveys it is deduced that 7% of dual purpose lamb producer's carry tail end lambs (assumed to be 20% of the total drop) to an age where they are at risk of cutting their teeth and approximately 5% of those tail end lambs do cut their teeth before they are sold. This represents 0.07% of dual purpose prime lamb production.

### **Opportunities of two teeth not in wear definition**

Dual purpose producers saw limited opportunities to change their systems through the change in definition to two teeth not in wear as they were either achieving target weights prior to lambs breaking teeth or would need substantially more time to finish lambs. They did note in their responses however that some lambs cut their first teeth near the point of sale and therefore these production systems do incur losses.

The stated opportunities from a change in definition to two teeth not in wear were;

- "Only advantage would be that price received for tail end would be higher."
- "Would provide the possibility of 30 days of extra spring feed to finish tail end lambs."
- "Would allow us to sell more of our wool trait based merino culls as lambs. We currently mouth them at 12-14 months after September shearing prior to sale."
- "See a significant advantage, the extra time would provide a greater margin of safety for producers with carry over lambs or traders. The eruption of teeth would give a "heads up" that they have to go in a few weeks."

The main case for an extension of the definition of lamb to two teeth not in wear therefore was to allow the small number of sheep that cut teeth and are therefore excluded from the existing lamb market and are sold as discounted product into the system.

### **Opportunities of two teeth but before eruption of third permanent tooth definition**

There were more opportunities indicated through a change in definition to two teeth but before the eruption of the third permanent tooth. Approximately 22% of producers could foresee that this may allow the system to change to a self replacing merino flock whilst achieving two shearings with wethers before they are sold as lambs for a greater price than currently achievable. The stated opportunities from a change in definition to two teeth but before the eruption of the third permanent tooth were;

- "This would be a definite advantage with merinos in our climate as we would get more weight in them and a higher price per kilo. As a result we would join less to terminals & more to Merinos especially if the wool market improved."



- “Sell 1st cross as normal. Longer period to finish merino wether lambs would mean they are held longer over spring”
- “More options for sheep particularly ewe hoggets, if store lamb market emerge would sell more there and run more ewes.”
- “More options for ewes and wethers. Could also open trading opportunities for lambs and take more risk out of buying in older age groups.”
- “Make a big difference (positive). Would ease the pressure on winter feed as wether lambs could be fattened into the spring or kept an extra eight months, shorn again, grown out and fattened at a slower pace.”

The change between a dual purpose system and a self replacing merino system turning off wethers between 1 and 2 years of age under the new definition of lamb is modelled and the results presented in the production systems modelling chapter. The impacts of the change in cost of production of lamb, mutton and wool are then reported in the industry modelling chapter.

### **Threats from a change in the definition of lamb**

The threats cited by dual purpose producers of a change in definition of lamb related to increased supply of lambs and the potential for a subsequent drop in price as well as the impacts of lower quality merino product causing consumer dissatisfaction leading to reduced demand. The stated threats from a change in definition were;

- “Increase supply which would bring down price.”
- “Increased supply of merino lambs to slaughter would cause price reductions. Tail end lambs would cross over more with new season lambs resulting in price reductions for old season lambs.”
- “Potential price reduction however supply-demand should sort this out. Key threat is consumer dissatisfaction”
- “Main threat is to the lamb brand on eating quality. Two teeth not in wear would be the ideal strategy.”
- “More Merinos, lowers the quality of the lamb product.”
- “From a merino perspective it is all positive. Although most probably be a price reduction but this can be easily offset by increased management options. The drop in price from lamb

to hogget really doesn't add up. Although lambs can take a setback when cutting their teeth.”

The survey responses clearly indicate that dual purpose producers see a small opportunity from the extension of the definition of lamb to two teeth not in wear because it would allow a small proportion of lambs that currently fall outside of market specification to make market specifications.

More importantly 44% of producers foresaw they could substantially alter their production systems with increased emphasis on merino genetics with the aim of turning off wethers and cull ewes between 1-2 years of age to improve profitability. This change in production systems has been modelled extensively.

### **Wool Producers**

There were 19 specialist wool producers surveyed with the majority from New South Wales as well as representation from Victoria and Western Australia. Specialist wool growers were defined as those that only used merino genetics.

There were a combined total of 146,021 ewes, 31,734 wethers and 79,099 hoggets represented in these flocks with the respective averages of 8,589, 1,983 and 4,653. The average flock structure represented shows that specialist wool flocks are also predominantly ewe dominant either as a result of destocking through drought or in an attempt to capture more income from higher sheep meat prices.

A total of 95% of the flocks lambed between July and October with one flock lambing in May. A total of 47% of the flocks sold lambs from their systems with target sale weights averaging 19.8 kilograms dressed and ranging from 17 to 22.5 kilograms. There was a range of sale ages from 5 to 13 months with 21% of all producers selling lambs at 13 months of age. Of those flocks selling wethers for slaughter the majority did so at ages of greater than two years.

### **Opportunities of two teeth not in wear definition**

Nine of the specialist wool producers (47%) cited opportunities for a change in definition to two teeth not in wear. Half of these are currently selling lamb from their system and the other half are not which suggests their system is designed such that their lambs just miss out on hitting specifications or they would change their system. Only half of those producers currently selling lamb (21% of total producers who sell lamb at 13 months of age) could see an advantage in a change in definition to two teeth not in wear, whilst the other half could not. The stated opportunities were;

- “Would give our lambs another month to hit weights which may help”
- “More potential weight in tail end. More time would mean more making sale as lambs and reducing those as hoggets.”
- “Gives you a little leeway if a few lambs are cutting their teeth where as now they automatically become hoggets.”

### **Opportunities of two teeth but before eruption of third permanent tooth definition**

More opportunities were identified if the definition was to change to two teeth but before the eruption of the third permanent tooth. The stated opportunities were;

- “Less pressure to finish tail enders”
- “Could be of benefit, sell wethers after the second shearing and increase ewe numbers if the economics stack up.”
- “Ewe hoggets could be sold at this age as lamb, but in the past restockers have been the purchasers.”
- “Preferred option as it allows wethers two shearings and still able to be sold off as lamb before 24 months.”
- “May change flock structure to take advantage of premium prices of hoggets.”
- “This will allow flexibility for the larger producers in areas where feed and weight gain isn't as easily accessible.”

These responses indicate significant production system changes in wool flocks either from selling lambs under the current definition to selling hoggets (1-2 years of age) as lamb under the new definition. The changes in cost of production for lamb, mutton and wool are modelled to capture the benefits of changing production systems and are reported in the chapter on production systems modelling. The impacts on industry of these changes are reported in the chapter on industry modelling.

### **Threats from a change in the definition of lamb**

The stated threats from a change in definition were;

- “Consumer dissatisfaction or uncertainty as to what they are buying.”
- “Risking the reputation of lamb quality to the consumer which in turn would lead to less demand and therefore lower price received.”

- “Price reductions for lamb likely.”
- “Supply increase. Suckers and two tooth merinos hit market together in spring. Buyers will be pickier with more numbers available. Live export may disappear due to lack of numbers.”
- “I believe there would be a price reduction. Processors are selling hogget as lamb already so supply may not affect change. More impact on merino numbers for slaughter than cross bred.”
- “The threats that I see with this change are the obvious ones that is, an increase in supply which in turn will soften the price received. The other major threat is controlling quality as the boundary of age is lengthened. This may have an industry effect and not just the producer.”

Wool producers were however divided in their reaction to a change in the definition of lamb to two teeth but before the eruption of the third permanent tooth. Approximately 80% stated that they would not change their production systems in response to any change in the definition of lamb even though 47% could see that there was opportunity for them if the definition was changed to two teeth not in wear.

These producers who were reluctant to change were either characterised by having systems that were very wool focused with wethers retained until 3-5 years of age and therefore thought that a move to take advantage of lamb under the new definition would introduce compromises, or they considered themselves specialist wool growers because that is where their interests lay and therefore they would not change.

The remaining 20% said they would definitely change and these producers all opted to introduce systems where they turned wethers off between 1 and 2 years of age because they thought it would be more profitable. This would allow these wethers to be shorn twice and the additional wool income as well as increased sale value of the animals was seen as potentially more profitable than current systems.

Responses showed that half of all wool producers see a significant opportunity from the extension of the definition of lamb to two teeth not in wear because it would allow a small proportion of lambs that currently fall outside of market specification to make market specifications. Approximately 21% of all wool producers foresaw that a change in the definition of lamb to two teeth not in wear would immediately help their business by allowing the 5% of all lambs that currently have teeth erupt to be sold as lamb.

In addition 42% of producers foresaw they could substantially alter their production systems with increased emphasis on merino genetics with the aim of turning off wethers and cull ewes between 1-2 years of age to improve profitability. This change in production systems has been modelled extensively.

## Production Systems Modelling

The methodology and assumptions for the production system modelling can be found in Appendix 1.

### Base scenario gross margins

All systems modelled were validated using five year average prices against average farm benchmarking data over the same period of time (Table 1) to ensure that the base models closely represented commercial performance.

**Table 1: Comparison of base flock modelled gross margins to Holmes Sackett and Associates benchmarking data (five year averages)**

	Wool			Dual Purpose			Prime Lamb	
	High Rainfall	Sheep Cereal	Pastoral	High Rainfall	Sheep Cereal	Pastoral	High Rainfall	Sheep Cereal
Age Wethers Sold	3-5yo	3yo	1yo	N/A	N/A	N/A	N/A	N/A
Lambing Date	August	August	May	August	July	April	July	June
Mid-Winter Stocking Rate	11.6	9.3	2	12.5	11	1.6	17	13
Modelled Income (\$/Ha)	\$393	\$302	\$49	\$571	\$354	\$39	\$529	\$411
Modelled Costs (\$/Ha)	\$122	\$102	\$13	\$175	\$105	\$13	\$151	\$106
Modelled Gross Margin (\$/Ha)	\$270	\$200	\$37	\$395	\$249	\$26	\$378	\$305
Benchmarked Gross Margin (\$/Ha)	\$280	\$204	\$32	\$398	\$261	\$23	\$380	\$304
Difference (\$)	-\$10	-\$4	\$5	-\$3	-\$12	\$3	-\$2	\$1
Difference (%)	3.6%	2.0%	-15.6%	0.8%	4.6%	-13.0%	0.5%	-0.3%

The key outputs needed from the modelling in order to model the industry impact of a change in production systems are the percentage change in the cost of production of lamb, mutton and wool and the change in the volume of each that is produced. These results are then fed into the industry model described subsequently, along with the marginal costs and benefits from other sectors of the industry, in order to assess the impacts on the industry as a whole through its impact on price.

Only the changes in production systems as a result of an extension of the definition to two teeth but before the eruption of the third permanent tooth have been modelled as no producer systems changes were nominated for a change in the definition to two teeth not in wear.

The changes as a result of a change in the definition to two teeth not in wear are included as marginal costs or benefits to each sector of the industry because they are not expected to bring about major changes in production systems.

In addition to this information the percentage changes to sheep numbers are presented as a response to changes in flock structure to provide an indication of how the change in definition and subsequent change in production systems might affect flock numbers.

The modelling results have been presented in two ways. The first set of results show the marginal change in cost of production and productivity under the extended definition from a range of wool production systems.

The second set of results show the marginal benefits for producers of moving to a wool production system turning off wethers at two years of age from other systems under the new definition. In the second set of results the relative difference between existing dual purpose and prime lamb systems is analysed.

### ***Marginal change in cost of production and productivity under extended definition***

The results of modelling the wool production systems are shown in tables 2 to 6. All systems have at least one thing in common irrespective of the flock structure which is that under the new definition where animals sold between 1 and 2 years of age would be defined as lamb the value of cull hoggets is increase substantially with the consequence being a lower cost of production for mutton and wool.

The size of the decrease in cost of production is dependent on what proportion of sheep sales are currently sold between 1-2 years of age. The modelling assumes that the historical long term average lamb price is received for the product when it is reclassified as lamb.

In all flocks, it is assumed that some cull ewe hoggets are sold and therefore all flocks have some product that is re classified as lamb and therefore receives a higher value.

In flock structures where wethers are sold between 1-2 years of age there is a substantial shift in production of lamb from mutton and the impact on the cost of production of mutton which is lowered between \$0.09 and \$0.32 per kilogram dressed weight. In the remaining flock

structures there is a much smaller shift in production from mutton to lamb with the subsequent decrease in cost of production of mutton from \$0.03 to \$0.08 per kilogram dressed weight.

Whilst there is no change in wool production because flock structures have not changed there is a substantial impact on the cost of production of wool. Wool cost of production is lowered because of the increased value of lamb sales which offsets more of the costs given to the wool enterprise.

In flocks that are selling wethers between 1-2 years of age the cost of production of wool is lowered by between \$0.60 and \$1.03 per kilogram clean. In the remaining flock structures the cost of production of wool is lowered by between \$0.10 and \$0.17 per kilogram clean in flock structures that are already selling lamb because of lower overall productivity.

The lamb cost of production for flock structures where wethers are sold as lambs (<1yo) is decreased by between \$0.02 and \$0.08 because of additional cull ewe hoggets sales as lamb. For the remaining flocks there is an increase in cost of production for lamb because under the existing definition sales of sheep between 1-2 years of age was not classified as lamb and therefore the cost of production was \$0. What is shown therefore is the cost of production of lamb in a merino flock where sheep sold between 1-2 years of age are classified as lamb.

The cost of production of this lamb varies between \$1.64 and \$2.49, with the lowest cost of production in each region coming from flock structures with wethers sold from 1-2 years of age.

**Table 2: Change in cost of production, gross margins and productivity with a change in definition of lamb to two teeth but before the eruption of a third permanent tooth for winter lambing wool flocks in the sheep cereal zone.**

<b>Sheep Cereal – Winter Lambing</b>					
	<b>Sell Wethers</b>				
<b>Sell Wethers</b>	<b>&lt;1yo</b>	<b>1-2yo</b>	<b>2-3yo</b>	<b>3-4yo</b>	<b>5-6yo</b>
Lamb CoP (\$/Kg Dwt)	-\$0.08	\$2.12	\$2.27	\$2.14	
Mutton CoP (\$/Kg Dwt)	-\$0.08	-\$0.32	-\$0.04	-\$0.04	
Wool CoP (\$/Kg Cln)	-\$0.17	-\$0.93	-\$0.15	-\$0.11	
Gross Margin (\$/Ha)	\$7	\$39	\$6	\$5	
Gross Margin (\$/WDSE)	\$0.68	\$3.93	\$0.58	\$0.51	
Lamb (Kg Dwt/Ha)	6.1	35.3	5.2	4.6	
Mutton (Kg Dwt/Ha)	-6.1	-35.3	-5.2	-4.6	
Wool (Kg Cln/Ha)	0.0	0.0	0.0	0.0	

**Table 3: Change in cost of production, gross margins and productivity with a change in definition of lamb to two teeth but before the eruption of a third permanent tooth for spring lambing wool flocks in the sheep cereal zone.**

<b>Sheep Cereal – Spring Lambing</b>					
	<b>Sell Wethers</b>				
	<b>&lt;1yo</b>	<b>1-2yo</b>	<b>2-3yo</b>	<b>3-4yo</b>	<b>5-6yo</b>
Lamb CoP (\$/Kg Dwt)		\$1.93	\$2.10	\$2.10	\$2.16
Mutton CoP (\$/Kg Dwt)		-\$0.29	-\$0.04	-\$0.04	-\$0.04
Wool CoP (\$/Kg Cln)		-\$0.80	-\$0.13	-\$0.11	-\$0.10
Gross Margin (\$/Ha)		\$47	\$7	\$6	\$5
Gross Margin (\$/WDSE)		\$4.74	\$0.68	\$0.58	\$0.46
Lamb (Kg Dwt/Ha)		42.6	6.1	5.2	4.1
Mutton (Kg Dwt/Ha)		-42.6	-6.1	-5.2	-4.1
Wool (Kg Cln/Ha)		0.0	0.0	0.0	0.0

**Table 4: Change in cost of production, gross margins and productivity with a change in definition of lamb to two teeth but before the eruption of a third permanent tooth for winter lambing wool flocks in the high rainfall zone.**

<b>High Rainfall – Winter Lambing</b>					
	<b>Sell Wethers</b>				
	<b>&lt;1yo</b>	<b>1-2yo</b>	<b>2-3yo</b>	<b>3-4yo</b>	<b>5-6yo</b>
Lamb CoP (\$/Kg Dwt)	-\$0.06	\$2.02	\$2.14	\$2.16	\$2.24
Mutton CoP (\$/Kg Dwt)	-\$0.06	-\$0.21	-\$0.03	-\$0.03	-\$0.04
Wool CoP (\$/Kg Cln)	-\$0.16	-\$0.81	-\$0.13	-\$0.11	-\$0.10
Gross Margin (\$/Ha)	\$8	\$47	\$7	\$6	\$5
Gross Margin (\$/WDSE)	\$0.68	\$3.90	\$0.58	\$0.51	\$0.42
Lamb (Kg Dwt/Ha)	7.3	41.8	6.2	5.5	4.5
Mutton (Kg Dwt/Ha)	-7.3	-41.8	-6.2	-5.5	-4.5
Wool (Kg Cln/Ha)	0.0	0.0	0.0	0.0	0.0



**Table 5: Change in cost of production, gross margins and productivity with a change in definition of lamb to two teeth but before the eruption of a third permanent tooth for spring lambing wool flocks in the high rainfall zone.**

<b>High Rainfall – Spring Lambing</b>					
	<b>Sell Wethers</b>				
	<b>&lt;1yo</b>	<b>1-2yo</b>	<b>2-3yo</b>	<b>3-4yo</b>	<b>5-6yo</b>
Lamb CoP (\$/Kg Dwt)		\$2.10	\$2.32	\$2.36	\$2.49
Mutton CoP (\$/Kg Dwt)		-\$0.24	-\$0.03	-\$0.04	-\$0.04
Wool CoP (\$/Kg Cln)		-\$1.03	-\$0.17	-\$0.15	-\$0.13
Gross Margin (\$/Ha)		\$77	\$11	\$10	\$8
Gross Margin (\$/WDSE)		\$6.41	\$0.95	\$0.82	\$0.65
Lamb (Kg Dwt/Ha)		50.7	7.5	6.5	5.1
Mutton (Kg Dwt/Ha)		-50.7	-7.5	-6.5	-5.1
Wool (Kg Cln/Ha)		0.0	0.0	0.0	0.0

**Table 6: Change in cost of production, gross margins and productivity with a change in definition of lamb to two teeth but before the eruption of a third permanent tooth for May lambing wool flocks in the pastoral zone.**

<b>Pastoral - May Lambing</b>					
	<b>Sell Wethers</b>				
	<b>&lt;1yo</b>	<b>1-2yo</b>	<b>2-3yo</b>	<b>3-4yo</b>	<b>5-6yo</b>
Lamb CoP (\$/Kg Dwt)	-\$0.02	\$1.64	\$1.81	\$1.81	
Mutton CoP (\$/Kg Dwt)	-\$0.00	-\$0.09	-\$0.01	-\$0.02	
Wool CoP (\$/Kg Cln)	-\$0.07	-\$0.60	-\$0.07	-\$0.06	
Gross Margin (\$/Ha)	\$1	\$4	\$0	\$0	
Gross Margin (\$/WDSE)	\$0.27	\$2.10	\$0.24	\$0.21	
Lamb (Kg Dwt/Ha)	0.5	4.2	0.5	0.4	
Mutton (Kg Dwt/Ha)	-0.5	-4.2	-0.5	-0.4	
Wool (Kg Cln/Ha)	0.0	0.0	0.0	0.0	

Whilst in absolute terms it looks like the pastoral regions have the least to gain from a change because the absolute changes to cost of production are the smallest, in relative terms these changes are just as large because the pastoral zone has slightly lower cost of production for wool, mutton and lamb to begin with.

## Summary

The modelled production systems show that, all else being equal, the merino wool industry as a whole would gain from a change in the definition of lamb to two teeth but before the eruption of the third permanent tooth, through an immediate increase in the income generated from these flocks via increased lamb sales.

The gross benefit to the merino wool industry needs to be compared to possible costs elsewhere in the sheep industry i.e. possible reduced profitability of the prime lamb industry, decreased meat eating quality, increased costs to maintain meat eating quality. These are explored in other sections of the report and then modelled for the industry as a whole in the concluding section.

### ***Marginal change from moving to a flock structure selling wethers between 1-2 years of age***

The previous results showed that the merino flock structure that has the most to gain from a change in the definition of lamb is that in which wethers are sold between 1-2 years of age. The results presented in tables 7 to 11 show comparisons between mainstream dual purpose and prime lamb enterprises for each production zone and a merino production system where wethers are sold between 1-2 years of age. The results presented also show the difference between other merino flock structures and a merino production system where wethers are sold between 1-2 years of age.

For winter lambing flocks in the sheep cereal zone a wool production system selling wethers between 1-2 years of age to take advantage of a change in the definition of lamb where existing crossbred and merino lamb prices are unaffected would have lower returns than existing prime lamb and dual purpose flocks, and higher returns than other ewe dominant merino flock structures (Table 7).

For spring lambing flocks in the sheep cereal zone a wool production system selling wethers between 1-2 years of age to take advantage of a change in the definition of lamb where lamb prices remain unaffected would have higher profitability than all other spring lambing merino wool production systems modelled, higher profitability than winter lambing dual purpose systems but still lower comparable profitability to winter lambing prime lamb systems (Table 8).

**Table 7: Change in cost of production with a change in production system under a new definition of lamb to two teeth but before the eruption of a third permanent tooth for winter lambing wool flocks in the sheep cereal zone.**

**Sheep Cereal – Winter Lambing**

	Dual Purpose – Winter Lambing	Prime Lamb – Winter Lambing	Age Wethers Sold			
			<1yo	2-3yo	3-4yo	5-6yo
Lamb CoP (\$/Kg Dwt)	-\$0.24	\$0.27	-\$0.19	-\$0.15	-\$0.02	
Mutton CoP (\$/Kg Dwt)	\$1.01	\$1.21	-\$0.03	-\$0.20	-\$0.08	
Wool CoP (\$/Kg Cln)	\$1.08	\$3.73	-\$0.64	-\$0.54	-\$0.21	
Gross Margin (\$/Ha)	-\$17	-\$73	\$11	\$19	-\$0	
Gross Margin (\$/WDSE)	\$0.17	-\$1.74	\$1.07	\$1.89	-\$0.05	
Lamb (Kg Dwt/Ha)	-31.8	-64.5	2.0	30.1	30.7	
Mutton (Kg Dwt/Ha)	21.3	21.3	0.0	-26.3	-19.5	
Wool (Kg Cln/Ha)	3.2	1.0	3.7	-1.0	-4.7	
% Change in Shearing No's	161%	269%	117%	103%	105%	

**Table 8: Change in cost of production with a change in production system under a new definition of lamb to two teeth but before the eruption of a third permanent tooth for spring lambing wool flocks in the sheep cereal zone.**

**Sheep Cereal – Spring Lambing**

	Dual Purpose – Winter Lambing	Prime Lamb – Winter Lambing	Age Wethers Sold			
			<1yo	2-3yo	3-4yo	5-6yo
Lamb CoP (\$/Kg Dwt)	-\$0.43	\$0.09		-\$0.17	-\$0.17	-\$0.23
Mutton CoP (\$/Kg Dwt)	\$0.91	\$1.11		-\$0.20	-\$0.16	-\$0.11
Wool CoP (\$/Kg Cln)	\$0.39	\$3.09		-\$0.60	-\$0.70	-\$0.86
Gross Margin (\$/Ha)	\$36	-\$32		\$31	\$33	\$45
Gross Margin (\$/WDSE)	\$5.46	\$2.37		\$3.07	\$3.28	\$4.48
Lamb (Kg Dwt/Ha)	-24.6	-57.2		36.5	37.3	38.4
Mutton (Kg Dwt/Ha)	25.7	25.7		-30.1	-21.1	-9.2
Wool (Kg Cln/Ha)	9.9	7.8		-0.6	-1.2	-1.7
% Change in Shearing No.	194%	325%		106%	110%	116%

For winter and spring lambing flocks in the high rainfall zone a wool production system selling wethers between 1-2 years of age to take advantage of a change in the definition of lamb where crossbred and merino lamb prices remain unaffected would have higher returns than winter lambing prime lamb flocks and dual purpose flocks, and higher returns than other winter lambing merino flock structures (Tables 9 & 10).

**Table 9: Change in cost of production with a change in production system under a new definition of lamb to two teeth but before the eruption of a third permanent tooth for winter lambing wool flocks in the high rainfall zone.**

**High Rainfall – Aug Lambing**

	Dual Purpose	Prime Lamb	Age Wethers Sold			
			<1yo	2-3yo	3-4yo	5-6yo
Lamb CoP (\$/Kg Dwt)	-\$0.37	-\$0.32	-\$0.27	-\$0.13	-\$0.13	-\$0.23
Mutton CoP (\$/Kg Dwt)	\$1.05	\$1.05	-\$0.12	-\$0.12	-\$0.12	-\$0.05
Wool (\$/Kg Cln)	\$1.83	\$3.48	-\$0.53	-\$0.41	-\$0.41	-\$0.42
Gross Margin (\$/Ha)	\$20	\$24	\$48	\$26	\$26	\$47
Gross Margin (\$/WDSE)	\$3.56	\$8.13	\$3.97	\$2.18	\$2.18	\$3.94
Lamb (Kg Dwt/Ha)	-64.6	-85.4	0.9	35.6	36.3	37.4
Mutton (Kg Dwt/Ha)	26.3	26.3	0.0	-32.4	-24.0	-12.2
Wool (Kg Cln/Ha)	-1.7	3.1	5.2	-1.4	-2.6	-3.9
% Change in Shearing No.	110%	249%	117%	103%	105%	108%

**Table 10: Change in cost of production with a change in production system under a new definition of lamb to two teeth but before the eruption of a third permanent tooth for spring lambing wool flocks in the high rainfall zone.**

**High Rainfall - Sept Lambing**

	Dual Purpose	Prime Lamb	Age Wethers Sold			
			<1yo	2-3yo	3-4yo	5-6yo
Lamb CoP (\$/Kg Dwt)	-\$0.48	-\$0.43		-\$0.14	-\$0.17	-\$0.28
Mutton CoP (\$/Kg Dwt)	\$0.99	\$0.99		-\$0.13	-\$0.11	-\$0.08
Wool (\$/Kg Cln)	\$1.50	\$3.16		-\$0.47	-\$0.50	-\$0.60
Gross Margin (\$/Ha)	\$65	\$69		\$40	\$51	\$76
Gross Margin (\$/WDSE)	\$7.35	\$11.92		\$3.32	\$4.22	\$6.35
Lamb (Kg Dwt/Ha)	-55.8	-76.6		43.2	44.2	45.5
Mutton (Kg Dwt/Ha)	31.7	31.7		-37.1	-26.1	-11.4
Wool (Kg Cln/Ha)	3.7	8.4		-0.7	-1.5	-2.1
% Change in Shearing No.	133%	300%		106%	110%	116%

In the pastoral zone with an autumn lambing the modelling suggests the most profitable system remains that where wethers are sold as lambs less than one year of age. As this is the dominant flock structure in the pastoral zone at present it is considered that there would be no significant shift flock structures as a result of a change in the definition of lamb in the pastoral zone.

**Table 11: Change in cost of production with a change in production system under a new definition of lamb to two teeth but before the eruption of a third permanent tooth for autumn lambing wool flocks in the pastoral zone.**

	Dual Purpose	Prime Lamb	Age Wethers Sold			
			<1yo	2-3yo	3-4yo	5-6yo
Lamb CoP (\$/Kg Dwt)			\$0.07	-\$0.17	-\$0.17	
Mutton CoP (\$/Kg Dwt)			\$0.06	-\$0.07	-\$0.02	
Wool (\$/Kg Cln)			-\$1.13	-\$0.28	-\$0.13	
Gross Margin (\$/Ha)			-\$4.53	\$3.24	\$3.18	
Gross Margin (\$/WDSE)			-\$2.27	\$1.62	\$1.59	
Lamb (Kg Dwt/Ha)			0.0	3.7	3.7	
Mutton (Kg Dwt/Ha)			-0.2	-2.8	-2.2	
Wool (Kg Cln/Ha)			0.0	-0.4	-0.7	
% Change in Shearing No.			106%	98%	96%	

## Summary

Under the new definition of lamb the relative profitability between existing merino flock structures and prime lamb and dual purpose enterprises would change.

In nearly all cases the most profitable wool flock structure becomes the one where hoggets are sold as lamb under the new definition. Approximately 40% of wool producers surveyed identified this and a further 20% suggested that they would change their systems to capture the benefits.

A further 22% of dual purpose producers surveyed suggested they would revert back to a self replacing merino system only as a result of a change in the definition of lamb to two teeth but before the eruption of the third permanent tooth.

If all else were held equal then a change in the definition of lamb to two teeth but no eruption of the third permanent tooth would be likely to drive significant long term flock structure changes in the high rainfall zone and the pastoral zone towards systems that aimed to sell wethers between 1-2 years of age. This change in flock structure would result in significant increases in sheep numbers shorn, significant increases in lamb production but also small decreases in wool production across the industry.

At present the merino industry is very ewe dominant as a result of recently higher sheep meat prices compared to wool prices and widespread drought leading to heavy destocking of wethers. Given this change in flock structure is already incorporated in the industry model, no attempt has been made to introduce further flock structure changes. In other words the assumption is that a change in the definition of lamb would be enough to prevent the industry from reverting back to historically more wether dominant flock structures is assumed.

## **Finisher Surveys**

Nine lamb finishers from Victoria, Western Australia, Queensland and New South Wales have been surveyed. The eight surveyed respondents finish a total of 140,000 lambs annually. The average number of lambs finished of the survey respondents was 17,000 with the smallest finisher finishing 1,500 lambs and the largest finishing 65,000.

The range in ideal purchase weight of lambs for finishing is 32.5 kilograms live weight per head to 39 kilograms live weight per head with an average of 35.5 kilograms. The ideal purchase age varied from 4 to 11 months of age. Finishers purchasing younger lambs generally looked for higher total weight gains than those purchasing older lambs.

The ideal time in the finishing system varied from 35 to 77 days with an average of 50 days. Finishers consider large weight gains or long periods on feed are not ideal.

Sixty two percent of finishers ideally purchase lambs 6 months of age or less and on average these finishers aim to add 15 kilograms of live weight. The ideal lamb purchase weight of the remaining finishers is between 9 and 11 months and these producers aimed to add an average of 9 kilograms of live weight.

All lamb finishers had an ideal age of lamb turnoff below 14 months. This was derived by adding the length of the ideal weight gain to the ideal purchase age. This suggests that all the surveyed lamb finishers have their finishing systems set up to finish either well before or around the eruption of the first permanent tooth to meet the current lamb definition specifications. A number of finishers did however indicate that a proportion of their lambs did not reach the desired weights before eruption and this resulted in a significant erosion of the profit margin due to the large price disparity between lamb and hogget.

The average number of lambs that do not reach specifications before eruption of teeth was 3% across all finishers.

Seventy-five percent or greater of respondents indicated that purchase price, purchase weight and grain price are important key purchasing indicators. A total of 62% of respondents considered sale price is an important key purchasing indicator and 50% consider availability is

an important key purchasing indicator. Other key purchasing indicators suggested as important include growth rates, grain imprinting, vaccination program, genetics, and target markets.

The inference of this is that the purchase price is determined by working backwards from the expected sale price and cost of feeding to ensure an acceptable margin. This often means that lambs need to be purchased at a discount to finished lamb prices. The long term average discount per kilogram of live weight of store lamb to finished lamb using NLRS data is 10%.

The implications of this for the finishing industry are that they will either get younger and lighter lambs that are specifically bred for finishing operations allowing producers to increase ewes joined per hectare and subsequently lower cost of production, or they will opportunistically get lambs that do not quite meet market specifications at the end of the growing season which breeders will offload so as not to compromise their next years production.

This is evident in survey responses with 62% taking lambs under 6 months of age and the remainder taking lambs from between 9 and 11 months of age. The latter group helps to explain why so few lambs are lost from breeding systems before they cut their teeth. In essence producers predominantly offload these lambs to specialist finishers (at a discounted price) because they recognise that they might not be able to finish them.

Respondents were asked whether they considered there is an advantage in changing the definition of lamb and where the advantage is likely to come from. There was a mixed response to this question. Four of those finishers surveyed considered that they would receive a benefit as a result of a change in lamb definition (to either definition). The benefits seen by those who considered there would be an advantage to a change in the definition of lamb include:

- Allowing the purchase of lambs later in the season with confidence that discounts would not be incurred for eruption of teeth.
- Removal of the 'cliff face' price reduction for eruption of teeth.
- Allows for purchasing of lambs later in the season.
- Will allow for purchase of lambs after eruption rather than before eruption and therefore will allow for better feed conversion ratios (FCR). FCR's were considered to be lower during eruption.
- Better payment for those lambs which are currently classified as hoggets.
- Will address the issue of processors gaining from the labelling of hogget as lamb.

- Better returns for lambs that have only just cut their teeth.
- Will allow for a longer selling season.

Three finishers considered that they would not receive a benefit as a result of a change in lamb definition. The reasons that they considered that there would be no benefits include:

- “Good lambs will meet their target weights well within 12 months of age anyway”
- “Reduced feed conversion ratios in lambs after eruption will result in lower profitability”
- “It is really just the same equation but at a different age”

Respondents were asked to comment on the likely threats posed to them as a result of changing the definition of lamb. All respondents considered that there were threats to them if the definition of lamb was to change. Following is a summary of the threats considered by finishers.

- “Perhaps consumers are used to the current product and might not be interested in an older animal which may follow through to poorer demand and price of product”
- “The sale price will always fall as the new season lambs reach the market weights as the processors prefer the younger product for QA reasons”
- “Quality issues such as hogget sold as lamb will have to be carefully managed”
- “A reduction in feed conversion efficiency would occur and this is very important for profitability”
- “There is a risk that people will rip off the system and exchange hogget for lamb”
- “Changing the definition of lamb will be of benefit to the Merino breeders rather than the producers of lambs specifically bred for the meat industry and the domestic and overseas consumer”
- “Possible lower price for lamb 14 months and younger”

Other comments of interest indicate that finishers are exposed to misrepresentation of the age of lambs prior to eruption and that this exposes them to discounts that significantly erode margins which are already quite low. Some comments follow:

- “Purchasing lambs that are older than their assumed age leads to the increased potential of eruption during the 5 weeks in the feedlot. This leads to subsequent discounts”.



- “Taking into consideration that the average margin is \$4 per head – all it takes is for one lamb to erupt to wipe out the profit margin on 10 lambs assuming a 50% discount for hoggets”.
- “An increased buffer (teeth erupted but not worn) would remove a huge amount of the uncertainty associated with feedlotting and would allow for the purchase of lambs for finishing a lot later in the season while removing the cliff face pricing of eruption”

From finisher and producer survey responses it is considered that;

- There would be a benefit to lamb finishers of an extension of the definition of lamb to two teeth not in wear as it would allow 3% of lambs finished that currently get discounted for the eruption of teeth to be sold as lamb under the new definition. It is assumed 20% of all lamb goes through a specialist finishing system.
- Producers indicated that they would be more likely to implement pasture based lamb finishing systems on farm and therefore it is expected it would encourage growth in the lamb finishing industry and increase competition for store lambs.
- Producers did not indicate that they would change the timing of sales under a change in the definition of lamb and therefore it is considered that the impact on seasonality of supply would be limited to the impact of additional lambs that fall into the new definition of lamb as two teeth not in wear rather than being downgraded to mutton.

For the purposes of modelling the impacts of lambs been downgraded to mutton on the finishing industry 20% of all lambs are assumed to go through specialist finishing systems, 50% of which are old enough to be at risk of cutting their teeth and 7% of those lambs cut their teeth before they leave the finishing system.

## **Live Exporter Surveys**

Three live exporters were surveyed, which combined exported in excess of 2.42 million sheep per annum from Western Australian ports. Of this total, 12.39% were classified as lambs, 3.3% as ewes and 84.3% as hoggets or wethers. One participant failed to detail exact numbers due to his belief that it would create a doubling up of figures, as their live sheep requirements are met under contract with other exporters who operate on a delivered basis. There was no significant variance in the range of each livestock class between the respondents. Of the total numbers exported, each company contributed approximately equally.

The average weight of sourced animals was not significantly different between the three participants; with lambs sourced at a minimum of 35 kilograms live weight for two participants,

ewes and wethers at greater than 48 kilograms live weight, and hoggets and wethers at greater than 42 kilograms live weight. One participant deals only in export crossbred lambs, and requires a minimum live weight of 38 kilograms.

Whilst two companies sought lambs from any sheep producing region of Western Australia, the third confined its sourcing to the Great Southern & Eastern areas, with the majority of lambs sought at 12 months of age, and all between 8 and 14 months.

Like the divergence in geographic sourcing for lambs, ewes were purchased off farmers from the same areas. Both ewes and wethers were only bought at 'mature' ages, or more specifically between 2 and 5 years. One company stated that it is not age, but rather weight and condition which are the deciding factors.

Hoggets and wethers were purchased from all across Western Australia by two respondents, although the other limited purchases to the Great Southern, Midlands & East and Northern wheat belts. One of the survey participants purchased wethers from 15 months to 2 years, whilst another purchased hoggets greater than 2 years of age, although the latter did note that it is not age, but rather weight which defines the classification of a hogget. This is similar to the third respondents reply.

The top two purchasing indicators from both respondents were weight and availability of supply respectively, with one participant then adding purchase price and sale price as additional purchasing indicators, and another participant adding condition score. All respondents were adamant that there would be no advantage to live exporters in a change in definition, with responses such as:

"I do not see any advantage – the market will take lambs, however most markets only want lambs until two teeth erupting".

"Whilst most exporters do ship lambs (on order) the much heavier more mature types go into hogget and/or young wether drafts at the feedlot in preparation for loading on the vessel. Genuine 'Lamb' is readily available, and to my understanding, is not shipped to big quantities to any market".

Both respondents alluded to the fact that lambs can only be sourced for the majority of markets in the absence of two teeth, with one respondent quoting that "we can only secure sheep (lambs) with lambs teeth (no 2 tooth)", and presently "any two teeth wethers or hoggets go as hoggets or young wethers, although weight, and not dentition, defines into which class they will fall".

This inference is that a greater supply of lambs, because the definition has changed, for the live export market is of no consequence because either their markets would not accept anything with permanent teeth erupted, or that the scale of live lamb export is so small relative to total sheep numbers, that the impact would be insignificant.

In regard to threats to the business, all respondents reported concern regarding increased local demand for hoggets to slaughter as lamb under the new definition. It was expected that this will reduce availability of hoggets and wethers for live export.

## **Processor survey results**

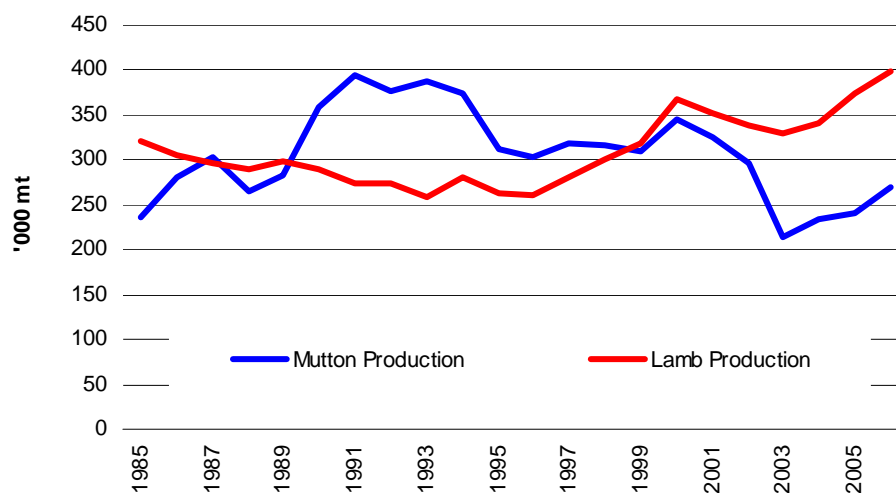
### ***Overview of lamb production & export data***

Lamb production has overtaken mutton production in volume terms as indicated in

Graph 1. This change reflects a shift in the national flock structure from specialist wool production systems with merino wether lambs retained on farm until up to five years of age to more meat focussed flock structures which are ewe dominant with wethers sold from the flock at much younger ages, or even as lambs. There has also been a shift to alternative, more meat focussed breeds and bloodlines.

The reasons for this shift have been both market driven with lower wool prices and higher lamb and mutton prices, and also a run of tougher seasonal conditions which have seen producers destock the wether portion of their flocks on a regular basis to avoid extensive supplementary feeding programs. In summary, the volume of lambs to the market has increased and, importantly, much of the seasonality which characterised the market two decades ago has diminished. This development may detract from the argument that an extended definition will smooth out supply: the growth in the market seems to have already brought this about.

**Graph 1: Significantly more lamb than mutton is processed now due to a rise in lamb production and a fall in mutton production**

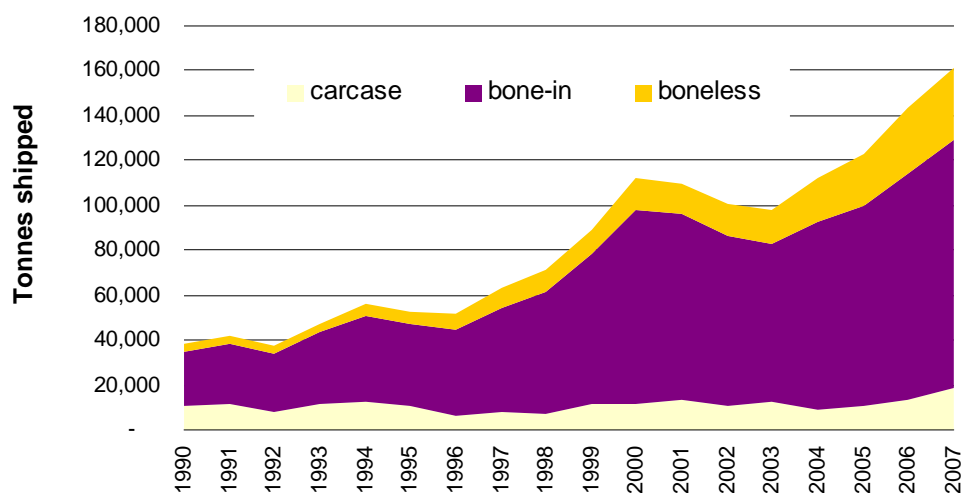


Moreover, a higher percentage of lamb production is now broken down into primal and sub-primal before end-user stage than was previously the case, both for the domestic and export sectors. This is evidenced by the significant level of investment in cutting rooms, packaging and palletising facilities over the past ten years. Retail chains and many overseas buyers now have more elaborate supply chains to meet market demand and require a guaranteed, consistent supply of lamb.

Total FOB value of lamb exports in 2007-08 was estimated at AU\$825 million and underpins virtually all of the growth in lamb production over the past decade as domestic consumption has stayed relatively constant.

As indicated in Graph 2 there has been considerable growth in lamb exports and a change in the composition of exports, especially in the period since 1998. Carcasses now are a smaller proportion of total tonnages, with bone-in cuts comprising about 70% of total shipments.

**Graph 2: The major growth in lamb exports is coming from bone in cuts rather than carcasses.**



### Existing lamb definitions

It is relevant to note in Figure 1 the existing definitions of lamb in use within key production and import markets. These definitions are presented to show what is considered to be a lamb carcass by the respective industries. The prevailing trend is for the use of age as the main criterion, or age in combination with dentition status. Only the New Zealand definition explicitly provides for animals to be described as lambs which are aged over 12 months but in which permanent incisor/s are present so long as they are not in wear. Therefore there seems to be a consistent message in a wide range of markets that lamb is an animal under 12 months of age, with the US system allowing 14 months in certain circumstances. If the Australian industry were to change the definition to animals that have no more than two teeth (up to ~ 24 months of age) it would be a substantive shift from the definitions in use in our main markets.

**Figure 1: Existing Definitions for Lamb – Key Markets**

<b>MARKET</b>	<b>RELEVANT DESCRIPTION</b>	<b>SOURCE</b>
AUSTRALIA	A lamb carcass shall be derived from a female, castrated male or entire ovine animal that shows no evidence of eruption of permanent incisor teeth	AusMeat Language; AQIS Meat Export Orders.
CANADA	-Fewer than two permanent incisors. -Two break joints or, in the case of a carcass with one break joint and one spool joint, the break joint has four intact and well-defined ridges with at least a slightly red and slightly damp surface. - Ribs that are no more than slightly wide, tend to be rounded rather than flat and are reddish in colour.	Canada Agricultural Products Act
EUROPEAN UNION	Carcases of ovine animals shall be divided into the following categories: - carcasses of sheep under twelve months old, - carcass of other sheep.	Council Regulation 2137/92, Commission Regulation 461/93
JAPAN	-Lamb: less than / under 12 months  -Mutton: more than / over or equal to 12 months old	Agriculture & Livestock Industries Cooperation (ALIC) through MLA Tokyo
NEW ZEALAND	-Lamb: Young sheep under 12 months of age or which do not have any permanent incisor teeth in wear.  -Hogget: A young male sheep or maiden ewe having no more than two permanent incisors in wear.  <b>COMMENT FROM NZ MCA:</b> “This definition allows sheep older than 12 months of age to be slaughtered as lambs if there are no permanent incisors in wear. This definition also allows for sheep with permanent incisors in wear to be slaughtered as lambs if it can be verified that the sheep are less than 12 months of age. Verification would be expected to be traced back to evidence that can unequivocally substantiates the age.”	NZ Meat Classification Authority
USA	A lamb is an immature ovine, usually under 14 months of age, which has not cut its first pair of permanent incisor teeth. -A yearling is an ovine usually between one and two years of age, that has cut its first pair of permanent incisor teeth but has not cut the second pair.	USDA through MLA Wash DC. United States Standards for Grades of Slaughter Lambs, Yearlings, and Sheep

Historically there was a period in the 1980's – 1990's in which a high percentage of Australian lamb exports entered the US market in chilled carcass form with foreleg attached and were

presented for USDA grading to enable them to compete directly with US domestic product. This practice has since subsided if not disappeared as exports now consist almost entirely of bone-in and boneless cuts. Similarly, New Zealand product exported to the US is virtually all in frozen bone-in or boneless form, with only a small percentage being carcasses.

The international sheep meat trade is dominated by the Australian and New Zealand industries. In price sensitive markets such as the Middle East Gulf there are also suppliers of niche products (very light, lean lamb carcasses delivered chilled daily to the market) which are generally considered more a nuisance than a consistent threat to Australian or New Zealand product. In premium markets, including the European Union and the United States, product from these two countries occupy strong positions at most price points in the retail and foodservice markets.

### ***Clarification of the New Zealand Definition***

There is a perception among some operators in the Australian industry that New Zealand exporters have an advantage in the marketplace to supply animals with permanent incisors as lamb. The question was clarified with the Meat Classification Authority (MCA) which is part of the New Zealand Meat Board. The results are shown in the table below:

The trade description for “lamb” in New Zealand is managed by the MCA along with other meat trade descriptions through administration of compliance and audit programmes with individual enterprises that are licensed to use the trade descriptions. Inspection procedures at plant level are audited and if they are found to be out of compliance there are penalties or the ability to use the ‘lamb’ description may be withdrawn.

In summary, New Zealand exporters can ship animals aged over 12 months that have no incisors provided stringent audit procedures are approved. The inspection procedure “sees” these animals as lambs. Animals with incisors in wear that are aged under 12 months may be shipped as lamb if unequivocal proof is available that they are in fact under 12 months. The incidence of this occurring, according to audit authorities, is extremely infrequent.

Finally, ovines under or over 12 months with permanent incisors present but not in wear can also be shipped as lamb from plants with approved audit procedures in place. The Authority also confirmed that more than 90% of lambs are killed at less than ten months of age with the median carcass weight being 17 kilograms. It is considered that the volumes of carcasses coming from the New Zealand industry in the shaded areas of Fig 2 below would comprise less than 4% of total slaughter numbers.



It is therefore true that New Zealand has the potential to ship product as lamb that Australia could not under the existing definition. It is however refuted that this is giving the New Zealand sheep industry a competitive advantage on the basis that their current production systems mean it is not been utilised.

**Fig 2: Clarification of New Zealand Definition**

	AGE	PRESENCE OF 1 OR 2 PERMANENT INCISORS?	INCISORS IN WEAR?	OK TO BRAND AS LAMB?	COMMENTS
OVINE	UNDER 12 MTHS	NO	NO	YES	
OVINE	OVER 12 MTHS	NO	NO	YES	MCA-administered classification system requires independent auditing of definition standard by dentition. The sample size is 20 carcasses, random audit basis, with a frequency of 3 to 12 audits per year. Performance-based (including other elements) auditing agencies also review processor-generated dentition assessment records for verification purposes. This programme applies to all ovine during the entire season with particular attention paid during October to January. Verification requirements for non MCA-licensed processors vary but are ultimately under NZFSA which administers similar standards.
OVINE	UNDER 12 MTHS	YES	NO	YES	
OVINE	OVER 12 MTHS	YES	NO	YES	
OVINE	UNDER 12 MTHS	YES	YES	YES	An interpretation of the definition allows for ovine that is less than 12 months of age with permanent incisors in wear to be classified as lamb. However the level of age verification required is considerable, to the extent that evidence that can be traced back must unequivocally substantiate the age. In reality this is not generally applicable in New Zealand due to the very low rate of permanent incisor development on their pastures.
OVINE	OVER 12 MTHS	YES	YES	NO	

### **Objectives of the processor survey**

In order to assess the potential effects on the processing and end-user sectors of the sheep meat value chain, a survey document was developed to form the basis of discussions with processors and end-users. Topics to be addressed included:

1. Size/location of plant/s (to identify relative significance of enterprise);
2. Major markets/s for lamb products in the past two fiscal years;

3. Primary livestock purchasing methods in past fiscal year;
4. Consequences for livestock value and for packing operations when ovines are found to have permanent incisor/s either pre-slaughter or post-slaughter;
5. Anticipated effect of changes to lamb definition on:
  - a. Plant operations e.g. yield
  - b. Livestock purchasing patterns
  - c. Price for livestock
  - d. Relationships with major customer/s
  - e. Supply and availability of suitable livestock

### **Companies in the survey**

There are approximately 79 abattoirs currently licensed to process ovines in Australia, of which 30 are registered with Australian Quarantine and Inspection Service (AQIS) and the balance with state food safety authorities or government departments. Approximately 35% of these 79 plants are classified as small plants and process fewer than 50,000 head annually.

A list of processing companies was developed which was deemed to be representative of the industry and to comprise a suitable mix of plants by size, state and registration status.

Companies contacted in the processor survey are shown in

Figure 3. In total, these companies control 27 processing plants throughout Australia. It is estimated this group accounted for approximately 60% of all ovine processing in Australia in 2007 and in excess of 55% of lamb slaughtering. Of the 21 companies contacted, meaningful responses were received from 19 companies.

**Figure 3: Processing companies contacted**

<b>ABATTOIRS/PROCESSORS</b>	
ASHTON PTY LTD	M C HERD PTY LTD
CASTRICUM BROTHERS PTY LTD	NORMANVILLE MEATWORKS PTY LTD
C.R.F. COLAC OTWAY PTY LTD	PITTSWORTH FOOD PROCESSORS
TOLSAT PTY LTD	R RADFORD AND SON PTY LTD
FLETCHER INTERNATIONAL EXPORTS PTY LTD	SOUTHERN MEATS PTY LTD
FREWSTAL PTY LTD	SWIFT AUSTRALIA (SOUTHERN) PTY LTD
GUNDAGAI MEAT PROCESSORS	TATIARA MEAT COMPANY PTY LTD
HARDWICKS MEAT WORKS PTY LTD	T&R (MURRAY BRIDGE) PTY LTD
JSA JACKSON GROUP	WAGSTAFF CRANBOURNE PTY LTD
JUNEE ABATTOIR PTY LTD	WESTERN AUSTRALIAN MEAT MARKETING CO-OPERATIVE LIMITED
KA OPERATIONS PTY LTD	

The composition of the survey group by various categories is examined at Figure 4.

**Figure 4: Composition of processing companies in survey group**

	<b>NSW</b>	<b>VIC</b>	<b>QLD</b>	<b>SA</b>	<b>WA</b>	<b>TAS</b>
<b>No. of plants</b>	7	9	3	4	2	2

	<b>&gt;1 million head</b>	<b>500,000- 1 million head</b>	<b>100,000- 500,000 head</b>	<b>&lt;100,000 head</b>
<b>No. of plants by production level p.a.</b>	6	7	9	5

<b>Export Plants</b>	<b>Domestic Plants</b>
17	10

### **Conduct of the survey**

The survey was conducted by telephone in the period 10 September – 7 October 2008. One processing company declined to participate. The purpose of the discussion and the sponsors (MLA and SCA) of the project were identified. Material regarding Sheep Meat Eating Quality (SMEQ) was not introduced until the respondent first identified the issue of tenderness/flavour regarding meat from older sheep.

Two options for consideration were outlined to the respondent, namely:

Option 1 - Ovines with one or two permanent incisors visible but not in wear would be accepted as lambs, with the surveyor nominating an increase in the age 'window' for lamb of approximately 30 days; and

Option 2 - Ovines with two permanent incisors in wear would be accepted as lambs but not with a third permanent tooth erupted, with the surveyor nominating an increase in the age 'window' for lamb of approximately 10 months.

The average length of interviews was 17 minutes. Approximately 30% of respondents' required explicit assurance that their comments would be handled in-confidence.

### **Quantitative results of the processor survey**

The processor survey sought to assess quantitative and qualitative information. The main quantitative outcome of the survey was the percentage of processors which want to see a change in the lamb description. These results are shown at Figure 5.

The dominant response by number of processors interviewed was for a change in the definition to two teeth not in wear.

**Figure 5: Disposition of Processing Companies Surveyed**

	<b>Description of Option</b>	<b>% of respondents in favour</b>
<b>Status quo</b>	No change to definition	<b>27%</b>
<b>Option I</b>	Definition be changed to include two-teeth animals where teeth are not in wear	<b>63%</b>
<b>Option II</b>	Definition be changed to include two-teeth animals where teeth are in wear	<b>5%</b>
	Abstaining	<b>5%</b>

### **Support for maintaining the status quo**

There was a strong correlation between those companies in favour of retaining the existing definition and those supplying product under contract to either of the two major domestic supermarkets. In light of the responses received from these key customers that they would not want a change in the definition of lamb it is not surprising that those processors that are closely aligned to supplying these key markets (approximately 45% of Australia's total lamb kill) stated that there is no advantage in changing the definition as their customers would not accept product under the changed definition (i.e. they would stick to their existing requirement that 100% of the kill has to be mouthed for no eruption of permanent teeth).

### **Opportunities of two teeth not in wear definition**

Of the processors which might support Option I, approximately 50% are primarily involved in the export market and typically have to send out-of-specification carcasses (for dentition) to the local market through wholesalers or other means as downgraded product.

Certain export markets including the USA typically take older and heavier animals and therefore the risk of 'shrinkage' is higher from animals that nearly but not quite meet specifications. Again it could be anticipated that some processors could see an advantage to their business from a change in the definition of lamb, provided it did not engender complaints from their customer about product quality.

The other important points to emerge from the discussions with processors are:

- Currently all the companies with a strong company brand at export level say they will not risk their reputation by packing anything as lamb that does not meet the dentition requirements and therefore they incur losses estimated to be \$15.6M (Table 28) as a result of lambs that are found to have teeth erupted prior to slaughter but which were purchased as lamb. A total of 30% of respondents suggested good lambs are being 'lost' through the fact that a permanent tooth has just broken through the gum and it cannot be classed as lamb.
- Around 50% of respondents believe that, for all its faults, the current regulations provide 'a line in the sand' that would become increasingly blurred if the concept of "not in wear" were introduced. In other words the same problem would exist about lambs that do not meet the revised specification but that the line for determining this would be more blurred because not in wear is harder to judge than eruption.
- Processors holding contracts with domestic retailers are very conscious of their contract requirements for all livestock/carcasses to be mouthed and are reluctant to call for change while these requirements exist because they know their major customer will not be in favour of it.

### **Opportunities of two teeth but before eruption of third permanent tooth definition**

There is very little processor support at any level for an extension of the definition out to two teeth in wear but before the eruption of the third permanent tooth because they could see no significant opportunities from this extension to the definition either in security of supply or higher processing weights.

On balance, processors did not foresee any significant reduction in processing costs that might flow from an extended definition. While some carcasses might come through heavier there would inevitably be some that did not dress out heavier and this would depend largely on how well they were managed in the last three-four weeks. Animals that are older by three weeks will not necessarily dress heavier than younger lines if they have had no better access to good feed.

### **Regulatory implications**

Approximately 30% of respondents are concerned at the lack of effective regulation by certain state authorities on the permanent incisor issue and 25% of respondents want stronger penalties for breaches of the regulations.

Two out of nineteen respondents called for the current regulations to be scrapped altogether, ostensibly leaving it up to the processor and the market to determine what is shipped as lamb.

Claims of inconsistent policing of regulations, between and within states and the potential to use self-assessment programs to effectively circumvent compliance to regulations were issues that were identified.

### ***Qualitative issues identified in the processor survey***

A number of key qualitative viewpoints emerged from the discussions with processors.

#### **“It’s a Cop-Out”**

This view was argued by 30% of processors surveyed. These respondents believe that the argument to extend the definition is merely an attempt to legitimise what is allegedly occurring with older sheep being processed and packed as lambs. A total of 20% of this group believe that accepting Option I is the slippery slope to accepting Option II and packing two-year old sheep as lambs.

All processors in favour of the current definition argue that adoption of Option I will encourage a minority of processors to continue purchasing older animals to substitute for lamb. Under this scenario, the processing industry will continue to be mired with arguments about what constitutes “teeth in wear.”

This counter argument states that no matter where the line is drawn for the definition of lamb there will always be a temptation to substitute lower value ‘mutton’ for lamb because of the price disparity. In other words this issue of substitution cannot be addressed via the definition. Whilst ever there is regulation in place there will be an ‘artificial’ disparity in value created between products that just classifies as mutton versus product that just classifies as lamb.

### **“Market Failures”**

Around 25% of processors put forward the view that producers who cannot get animals to target weights well before cutting permanent teeth are inefficient and are not serious about their business. To this group, marginal seasonal conditions and high cost of feed are being used as excuses for poor production and management practices, coupled with over-zealous stocking rates which force sheep to compete for scarce feed with subsequently poor weight gain results. There was a strong correlation between processors holding this view and those believing the extended definition constituted a “cop-out”. These processors are typically proactive in securing livestock through direct means and need a high level of assurance that their livestock will be at a target weight by a certain date as they have forward contracts they need to supply against.

### **“Strategic Fit with New Zealand Industry’s Definition”**

Most of the processors in favour of Option I referred to the possible strategic advantage of aligning our industry with New Zealand’s lamb definition, thereby enabling the inclusion of ovines whose first permanent teeth are about to erupt or have just erupted. On their line of thinking, the Australian product could compete more effectively year-round with New Zealand lamb.

Three export processors, however, rejected this argument, stating that the New Zealand industry is highly seasonal and produce lighter lamb whereas ours has become a year-round industry delivering a heavier average carcass weight. This group feels there is not a supply peak in need of smoothing out and that the most efficient, specialised producers are able to meet their weight and time targets.

### **“Eating quality will be affected in older sheep”**

Option II was soundly rejected by all but one party, with processors arguing that eating quality would be severely compromised in two-teeth in wear animals, particularly in regard to those animals that could be expected to be turned off from the wool sector.

While SMEQ research found older sheep from MSA pathways could produce palatable meat, most processors asserted there is no return currently in adopting MSA. Lambs processed under the MSA program are currently around 10,000 per month (MLA, October 2008).

Several processors emphasised the perceived high start-up costs for installing MSA and the difficulty in seeing a return in the current market. A number of factors made it difficult to provide establish firm costs for introduction of MSA into plants. These issues relate to:



1. Existing level of AusMeat accreditation which may mean some pre-conditions are already being met.
2. Existing level of training and competence among staff
3. Physical layout of floor near the stunning and bleed areas
4. Existing chiller arrangements
5. Current bleed times/need to extend bleed times

To illustrate the range of potential costs, an estimate of costs under two scenarios for implementing adequate MSA measures to control eating quality in sheep under the two teeth in wear definition are estimated in table 12.

Scenario One - Ausmeat accredited plant; higher level of competence and process control, export-registered or equal; kill rate of 4/minute or higher.

Scenario Two – domestic-registered plant, non-Ausmeat accredited, kill rate of 3/minute or fewer.

**Table 12: Estimated cost of implementing MSA sheep meat quality assurance measures in processing plants.**

	Scenario 1 (2000/wk)		Scenario 2 (600/wk)	
Training Fees (\$2000/person)			\$4,000	\$4,000
Trans/accom (\$1500/person)			\$3,000	\$3,000
Replacement staff (\$1,400 per person)	\$2,000	\$2,000	\$2,800	\$2,800
<b>STAFF TRAINING (2 people)</b>	<b>\$2,000</b>	<b>\$2,000</b>	<b>\$9,800</b>	<b>\$9,800</b>
<b>EQUIPMENT/GEAR COSTS<sup>1</sup></b>	<b>\$5,000</b>	<b>\$6,000</b>	<b>\$9,000</b>	<b>\$13,000</b>
e-stim modules <sup>2</sup>	\$60,000	\$60,000	\$25,000	\$40,000
chillers, trucks <sup>3</sup>	\$4,000	\$4,000	\$4,000	\$4,000
refurbishments <sup>4</sup>	\$7,000	\$7,000	\$7,000	\$7,000
<b>INFRASTRUCTURE COSTS</b>	<b>\$71,000</b>	<b>\$71,000</b>	<b>\$36,000</b>	<b>\$51,000</b>
<b>CAPITAL STARTUP COSTS</b>	<b>\$78,000</b>	<b>\$79,000</b>	<b>\$54,800</b>	<b>\$73,800</b>
Expected Return on Investment	15%	15%	15%	15%
<b>ANNUAL RETURN REQUIRED</b>	<b>\$11,700</b>	<b>\$11,850</b>	<b>\$8,220</b>	<b>\$11,070</b>
Staff <sup>5</sup>	25000	\$25,000	\$25,000	\$25,000
Maintenance provision	3000	3000	\$3,600	\$5,100
Cost of Capital Investment	\$11,700	\$11,850	\$8,220	\$12,540
<b>RUNNING COSTS</b>	<b>\$39,700</b>	<b>\$39,850</b>	<b>\$36,820</b>	<b>\$41,170</b>
per head cost	<b>\$0.40</b>	<b>\$0.40</b>	<b>\$1.23</b>	<b>\$1.37</b>
per kilogram cost (@21kg av.)	<b>\$0.02</b>	<b>\$0.02</b>	<b>\$0.06</b>	<b>\$0.07</b>

<sup>1</sup> Comprises pH probes, access to computer, GR implements, manuals etc

<sup>2</sup> Expenditure influenced by chain speeds/number of modules required. High speed high volume plants require more modules/greater charge

<sup>3</sup> Provision for changes to chillers/trucks

<sup>4</sup> Provision for alterations to plant floor e.g. move equipment, wash cabinets, electrical work, integration, supervisory inclusions for above

<sup>5</sup> Comprises further training, oversee program compliance requirements. Preliminary estimate of 0.5 persons full-time scales operator coordinator. This will vary between plants: higher volume plants will use more staff time

Processors also believed that they would need to pay more for the lambs aged between 1-2 years in order to secure a product that they were confident would meet MSA sheep meat standards. Processors nominated a figure of \$3.00 to \$3.50 per head which is a range of \$0.14 to \$0.17 per kilogram of carcass weight for a 21 kilogram carcass. This cost is not included in the modelling on the impacts to industry as it is assumed that the lower costs of production might negate the need to pay more for product. Instead a breakeven increase in processing cost of production is modelled so as to determine the likelihood that benefits to sheep producers might be negated by additional costs of product quality assurance.

### **“The Customer Rules on Price and Quality”**

Each processor had a clear understanding of what their customer will bear and the trade-off they will accept in terms of price and quality. For example, while several packers might be tempted by the prospect of Option I, they anticipate that their supermarket customer will reject it outright and it consequently loses appeal to them.

Packers with a strong branded product presence are typically able to get a better price for their lamb and are confident that, given time, their best buyers will eventually shun cheaper lamb products because they do not deliver on quality. For their foodservice and wholesale customers, processors know which end-use streams can sustain some compromises without damage to the relationship.

As explored in key customer responses the major supermarket buyers are not interested in Option I and certainly not in Option II because they currently have their suppliers and processors striving throughout the year to meet their contract's stringent age/weight specifications. The supermarkets are not interested in making it easier for suppliers to meet their targets but are interested instead in preserving their quality image with consumers and meeting overall revenue targets.

### ***Existing and potential commercial considerations***

There were two schools of thought about the effect that the Option I definition would have on lamb prices and lamb sales.

School 1 - Extended definition would smooth out supply, without compromising quality and would provide more even returns to producers throughout the year. It would enable industry to fulfil growing demand in overseas markets. Approx 57% agreed with this concept. This group was skewed towards plants killing for domestic wholesale and butcher market and generic product for export.

School 2 – Adherents to this view feel that an extended definition will not improve availability of quality lamb; will not deter intentional misdescription; and will not deliver higher returns to producers. Approximately 27% agreed with this concept, but it is relevant that the largest processors in the industry maintain this viewpoint. This group state that a change in definition will not make them change their buying patterns, would not entice them to buy older sheep or to change their marketing practices. About 20% felt that a change in the definition could result in a 'glut' of older animals, lead to price disruptions at the older end of the market but that they would still end up paying a premium price for current definition lamb. It is estimated that this 20% of processors represent approximately 40% of processing.

Discount rates for ovines presenting with an erupting/erupted incisor range from 30%-50% of original value. The following practices were observed in regard to processing out-of-specification animals:

- kept aside and put through as special run at the end of production
- processed at same time as other animals and put in slash/manufacturing pack
- offered to wholesalers for specialty customers who will accept carcasses from older animals.

The quantity of livestock likely to fit into the out-of-specification category will change depending on seasons, feeding regime, care in drafting by grower/finisher and other factors. It is not possible to estimate precisely what percentages present at slaughter with erupting or erupted teeth, although three export-focused processors buying primarily at saleyards put their numbers at less than ten percent for the three months ended August 2008. For the purposes of the modelling these figures have been extrapolated as representative of the industry with some sensitivity analysis included assessing the impact if the assumptions are wrong.

## **Key Customer Surveys**

### ***Domestic End-User Sector***

A similar exercise was conducted for the domestic wholesale/end-user sector in order to gauge views and likely consequences for their businesses if the definition of lamb were changed. The companies contacted in this stage of the project are indicated in Figure 6. In total this group comprised three national supermarket chains and a number of significant national food service and catering operators, and meat wholesalers, a total of 15 companies with meaningful responses being received from 13 companies. It is estimated that the

foodservice companies in the survey group would service approximately 30%-35% of lamb supplied into the non-retail sector.

The survey result for this category shows an overall strong preference for the current lamb definition to remain unchanged. Similar to the results of the discussions with processors, about 65% asserted that the current definition represents a distinct ‘line-in-the-sand’ which can be readily measured, whereas to relax it would introduce a grey area. This grey area would therefore make it easier for companies to misrepresent product and for any malpractice in the industry to continue.

About 30% of respondents volunteered the view that the industry has ongoing problems with lamb substitution (respondents’ choice of words, as this was outside the terms of reference for this project) and that standards are not adequately enforced. Two of the respondents in this category called for a national system with a requirement in all States for 100% moulting, enhanced monitoring and larger penalties for offenders. It is significant that major supermarkets and 70% of the wholesale/HRI participants are of the view that the prime lamb production industry has the ability and the capacity to ‘get the job right’ within the current definition, and that producers who claim to need a relaxation of the definition in order to finish lambs properly are inefficient.

The survey also shows that the end-user group believes that their customers rely on them to get the quality right, and they in turn expect their suppliers to do the same. Given that this group represents very significant volumes of lamb in valuable supply contracts, their suppliers mouth every animal and ensure that what is delivered is a quality article. Note that there is a distinction made by end-users that the Lamb brand denotes only a category of livestock, not a statement of quality, and it is only by dealing with the right suppliers that the quality part of the equation is met.

**Figure 6: End-users surveyed**

<b>WHOLESALE/END-USERS</b>	
ANDREWS MEAT INDUSTRIES PTY LTD	HAVERICK WHOLESALE MEATS
AUSTRALIAN UNITED RETAILERS LIMITED	IGA DISTRIBUTION/METCASH
BEAK AND JOHNSTON PTY LTD	LENARD'S PTY LTD
BIDVEST AUSTRALIA LTD	TEYS FOOD SERVICES PTY LTD
COLES SUPERMARKETS	TOP CUT FOOD INDUSTRIES PTY LTD
CROWN CASINO	WOOLWORTHS LIMITED
DICK STONE PTY LTD	FOODWORKS LTD
EUREST (AUSTRALIA) PTY LTD	

The data in Fig 7 shows the disposition of domestic end-users towards any change in the definition. The high level of companies in favour of retaining the existing definition is apparent

and the metaphor 'line in the sand' was mentioned often by these those respondents. It is also arguable that this group would be the least agreeable of supply chain stages to relaxing a set of standards which are already being met in favour of a less-defined, more subjective standard.

Certainly it was evident in the discussions with the major chains that they saw no reason to expand the definitions as in their view the specifications they currently have in place to supply a quality product to the market. Their buyers or processors source the product to meet the existing requirement and the onus is on those other parties – not the supermarkets – to find the stock. It was in fact argued by one of this group that the current requirement for all lambs to be mouthed is effectively preventing more animals in the hogget category reaching the consumer and is assisting in retaining value in the lamb category.

**Figure 7: Disposition of Domestic End-Users Surveyed**

	<b>Description of Option</b>	<b>% of respondents in favour</b>
<b>Status quo</b>	No change to definition	<b>55%</b>
<b>Option I</b>	Definition be changed to include two-teeth animals where teeth are not in wear	<b>30%</b>
<b>Option II</b>	Definition be changed to include two-teeth animals where teeth are in wear	<b>10%</b>
	Abstaining	<b>5%</b>

### **Export End-User Sector**

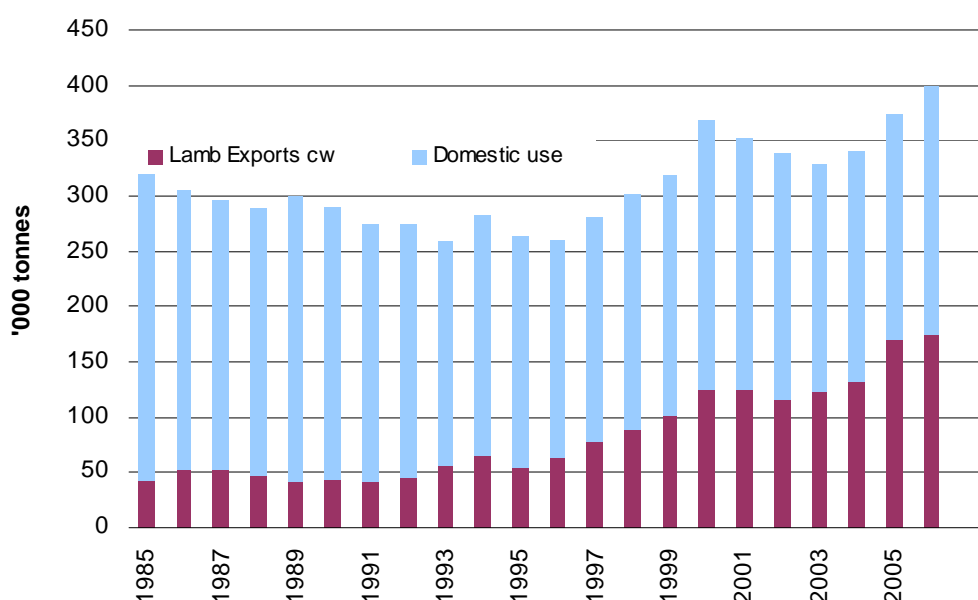
The potential consequences in export markets for an expanded definition of Australian lamb were assessed through two means:

- discussions with a sub-set of exporters in the course of the processor survey, and
- MLA regional managers and locally-based staff.

Almost without exception this group of respondents noted the significant increase in lamb shipments (see Graph 3), higher unit value and the superior reputation in the various markets for Australian lamb. As a group they also noted that market growth has largely sprung from the industry's increased ability to supply virtually all year-round a consistent standard of product. Along with New Zealand product (which is struggling currently with lower production levels due to drought and industry restructuring) it is the undisputed leader in key import markets.

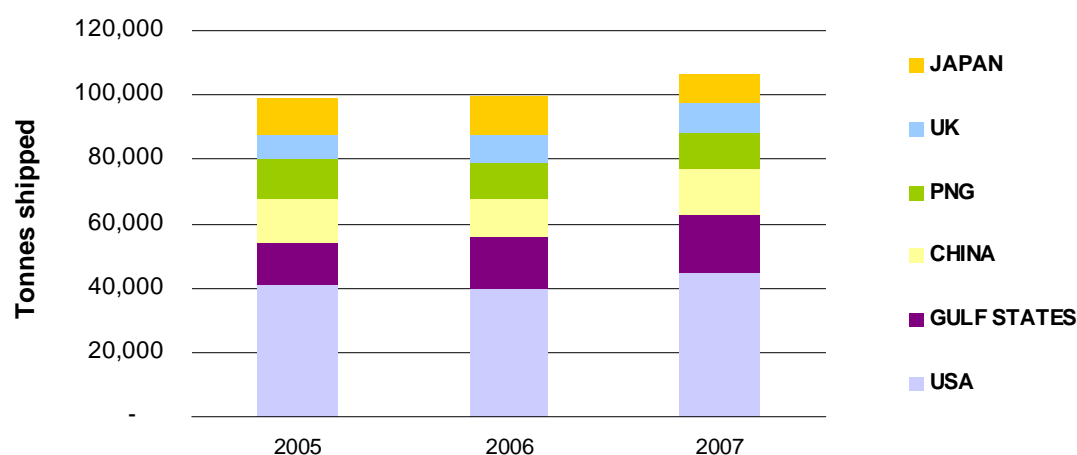
Among the exporter component, there were again two groups of opinion. Around 50% of exporters included in the survey were of the opinion that their livestock buying arrangements would not change and that their customer bases would still want to take the type of lamb they are now supplying. Even to markets where heavier carcasses are required, these packers argued, the industry is able to supply currently without pushing the requirement of no permanent incisors. In large measure, this group of exporters pack their own branded product which has been developed through concerted marketing efforts over the past ten-fifteen years. As much as selling 'lamb,' this group states they are selling a particular standard of quality lamb which could have its reputation in the market compromised by inferior or marginal product.

**Graph 3: Growth in Lamb Production and Exports (carcase weight)**



There was a strong feeling that the extended definition would enable other players to 'ride on the coat-tails' of the concerted effort they themselves had made to develop the market. In their opinion, the market they service would only need one or two shipments of competing (older) product to distinguish between price and quality. They were also very concerned about the extended definition would have on buyers' mentality and that they would equate a wider definition with an increased supply potential and therefore lower prices over time.

Also, in every major market, but particularly Japan and USA, the consumer is described as being highly sensitive to sheep meat odour, aroma or strong taste which could potentially emanate from older product.

**Graph 4: Major Export Markets for Lamb**

The other 50% of respondents felt that the two teeth not in wear definition would definitely assist their position in the marketplace by keeping a lid on price during the slow winter months when a plentiful supply of finished livestock might not be available. It would enable them to keep shipping higher volumes without incurring buyer resistance to higher prices. Around 30% of this sub-group of exporters also found some merit in the two teeth in wear definition, presuming that an increase in the number of lambs available would keep livestock prices in check. This group detects that there is much growth still left in some markets, for example China and Japan, which could possibly be met through an extended product definition.

The following factors emerged in discussions about key lamb markets (Graph 4):

**USA** – (approximately 40,000 tonnes p.a. shipped weight) Consumers are highly sensitised to lamb product which they perceive has a strong odour, aroma or flavour. Consistent efforts over the past two decades have enabled the industry to build up a highly positive profile at retail and foodservice level, but it is still susceptible to competition from domestic product and claims that the product is ‘rangy’ or has an overpowering flavour. Introduction of an extended definition would require careful handling from a public relations viewpoint and could potentially destabilise the very successful and consistent level of exports direct into US supermarkets which are a major portion of the shipment levels to the US. The specification of cuts currently entering the market for foodservice is considered to be ideally suited for customer requirements and there is no real gap to fill for bigger primals.

**Japan** (approximately 10,000 tonnes p.a. shipped weight). This market has also developed from careful management of product quality and presentation, successfully responding to consumers’ concerns about taste and aroma in sheep meat. There is considered to be further

growth potential in this market and lamb is virtually synonymous with 'Australia'. Foodservice is the main vehicle for sales in Japan and although it is considered that buyers would be relatively relaxed in principle about the extended definition, they would be highly cautious about the impact this could have on taste and odour. According to respondents, these buyers would exhibit more resistance with the definition being two teeth in wear. Liaison and taste-testing would be required to get buyers on-side and to allay any concerns about issues with consumers.

**Korea** (approximately 2,000 tonnes p.a. shipped weight). The market is considered to have only limited potential currently. The buyers in this market could be amenable to an extended definition if it was portrayed in the appropriate manner and the specifications suited the requirements emanating from the foodservice sector.

**European Union** (approximately 19,000 tonnes p.a. shipped weight). Access for Australian product is currently restricted to approximately 19,000 tonnes per annum of mutton and lamb, with mutton normally comprising about 30% of shipment levels. The UK is the single largest market and takes about 50% of shipments. Access to this market is highly prized and quality expectations are high. Option II (two teeth in wear) would make negotiations for greater access to the market very problematic and would likely have a negative impact initially on consumer and trade perceptions about the product. Within the European Union there are many markets, a few of which could potentially be agreeable to accepting the stronger product taste that Japanese or American customers might eschew. However, in the main, European buyers will react with caution to any attempt to introduce older animals into the definition and would be suspicious of a definition which is at variance with the definition used within their domestic regulations.

**Middle East Gulf** (approximately 18,000 tonnes p.a. shipped weight). This market is complicated by the presence of many suppliers of cheaper lamb and sheep meat both in live and in chilled form. Australia's reputation is strong as a supplier of quality lamb product however extending the definition to older animals, particularly if the older animals have been compromised by drought or poor finishing, could very quickly jeopardise this. The point was made that the taste outcomes from live sheep sent into the market from Australia are highly acceptable because of the careful management of feed rations and animal stress levels, and it was queried whether this would apply for sheep that are almost two years old. This market can be very price sensitive and the expectation may develop on buyers' part that a wider definition will lead to lower prices.



**China** (approximately 15,000 tonnes p.a. shipped weight). This market has developed rapidly and, although price sensitive, there is strong demand continuing to grow from all levels of the foodservice sector. The market will reject product with strong odour or tough characteristics. There was a general sense that this market could accommodate a change in the definition to two teeth in wear provided the product quality was very carefully monitored.

**PNG** is considered a commodity market at present, taking frozen neck and frozen breast & flaps or other tertiary cuts which come from supply to premium markets.

With some specific exceptions, all parties stated that Australian lamb exports connote high quality in the international marketplace. This is due to Australian exporters' efforts to develop overseas markets over the longer term and to refrain from shipping inconsistent product under their own brands. Exporters are reluctant to see their efforts potentially compromised and, moreover, believe that an extended definition for lamb has the potential to increase the quantity of marginal product entering the marketplace.

Many exporters stated that they are receiving fair returns from markets that pay for quality, but that a wider definition will suggest to their buyers that price cuts are in store down the line. Also, in every major market, but particularly Japan and USA, the consumer is very sensitive to any change in odour, aroma or taste profile which could emanate from older product.

The paramount concern for the packers involved in export is that a change in definition will cause unrest in the market about quality, then it will cause price disruptions and that the careful management of sales over the preceding period will be compromised.

## **Key survey outcomes and inputs for modelling**

### ***Extension to 'two teeth not in wear'***

The immediate benefit cited along the supply chain from producers through to processors of an extension to the definition of lamb from no permanent teeth erupted to two teeth erupted but not in wear was that lambs that just cut their first permanent teeth as they are finished are discounted when for all intents and purposes they are the same quality product as their cohort which may be only days from cutting their teeth. This assessment is supported by the Sheep Meat Eating Quality outcomes which suggest no significant change in eating quality over this period.

Another possible benefit cited was that increasing the age at which animals can be classified as lamb would help to smooth out the supply of lamb across the year. This is not modelled but the concept is addressed separately.

The main threat (and therefore potential cost) mentioned from the extension of the definition to two teeth not in wear by end users and processors was that no eruption of permanent teeth is an easier distinction to regulate than two teeth not in wear and it is a line further from a two teeth definition. The definition two teeth not in wear is considered to be more ambiguous and therefore more open to substitution with older product which poses a risk to eating quality and possibly demand for lamb.

Substitution is not addressed in the industry modelling because the model assumes 'free trade' of product and cannot accommodate 'illegal' trade. The practice of substitution is also addressed in a separate chapter of the report using some of the modelled outcomes.

The industry modelling has been used to quantify the benefit of an extension to the definition to producers, finishers, and processors from inclusion of lambs that just fall outside specifications, under the assumption that the extension of the definition would remove all losses incurred from eruption of teeth.

The number of lambs that are affected by an extension to the definition of lamb have been worked out according to the following assumptions based on industry data or survey results.

- 8% of prime lamb producer's carry tail end lambs (assumed to be 20% of the total drop) to an age where they are at risk of cutting their teeth and 5% of those lambs do cut their teeth before they are sold. This represents 0.08% of specialist prime lamb production.
- 7% of dual purpose lamb producer's carry tail end lambs (assumed to be 20% of the total drop) to an age where they are at risk of cutting their teeth and approximately 5% of those tail end lambs do cut their teeth before they are sold. This represents 0.07% of dual purpose prime lamb production.
- 20% of all lambs go through finishers, 50% of which are old enough to be at risk of cutting their teeth and 7% of those lambs cut their teeth before they leave the finishing system.
- 2.5% of all lambs purchased by processors are rejected because they have cut their teeth, which are identified at slaughter.
- every lamb that cuts its teeth costs an average of ~\$36 per head to the industry because it is downgraded to mutton.

The benefits to the industry of an extension of the definition of lamb to two teeth not in wear is quantified by calculating the cost to each sector of lost income from down grading lamb to mutton based on these estimates of quantities.

### ***Extension to 'two teeth – before the eruption of third permanent tooth'***

The immediate benefit cited along the supply chain for the extension of the definition to two teeth but before the eruption of a third permanent tooth came from dual purpose lamb and specialist wool producers who could foresee that it could significantly improve the profitability of production systems based on merino genetics only.

A more consistent supply of product was also mentioned as a benefit of an extension to the definition of lamb to two teeth but before the eruption of the third tooth. This is again addressed separately to the industry modelling.

The main outcome of the farm systems modelling was that in wool production systems the cost of production of wool would decrease by up to \$1.03 per kilogram because of the extra value created from mutton sales being shifted to lamb sales. The changes in cost of production for wool, lamb and mutton across all enterprise mixes are included in the industry model.

The farm systems modelling also showed that there were significant enough benefits to the wool industry to cause retention of existing ewe dominant flock structures in wool flocks and possibly a move away from dual purpose systems to a merino flock selling wethers between 1-2 years of age. In all of these cases, where stocking rates are kept constant the number of sheep on farm would increase. The industry model cannot readily incorporate a change in flock structure and therefore the results presented reflect only the impact on the current national flock structure. This is therefore potentially an underestimate of the benefits to the wool industry in the long term but unlikely to be of significant consequence in the short to medium terms as adoption of new practices is traditionally slow.

The 2008 Wool Desk Report compiled by Australian Wool Innovation reports that 85% of all sheep in Australian are merinos and that 75% of merino ewes would be joined to merino rams. It is therefore significant that such a large part of the industry has a lot to gain from a change in the definition of lamb to two teeth but before the eruption of the third permanent tooth.

A change in definition to two teeth but before the eruption of the third permanent tooth was largely resisted by both domestic and export end users on the basis that;

1. end users believed that it would have negative impacts on eating quality
2. processors believed that end users would resist it
3. some processors, particularly those operating in small to medium sized plants, believed that the cost of implementing MSA sheep meat quality assurance programs to limit the

increase in consumer dissatisfaction was high. This cost was estimated to be \$0.02 to \$0.07 per kilogram dressed weight (Table 12).

The Sheep Meat Eating Quality outcomes show that with MSA sheep meat compliance in place the decrease in eating quality can be limited to 3 times the current rate of consumer dissatisfaction (~15% consumer dissatisfaction). If this risk was considered acceptable, then the processing industry would have to adopt MSA standards.

The benefits to the sheep industry of lower cost of production of wool are modelled in the industry model without additional costs incurred to limit decreases in eating quality. The breakeven for additional costs to processors of implementing MSA sheep meat quality assurance programs to control quality and the restricted access to markets is also provided.

## **Substitution**

The issue of substitution was raised in all survey groups as an existing cost to the industry. It is a wide held belief that substitution occurs now however the responses varied as to what impacts a change in the definition of lamb might have on the cost of substitution.

Some respondents believed a change in the definition to two teeth not in wear would allow more substitution than is currently occurring because it is a more ambiguous line and therefore there is more room to 'bend the rules'.

A minority of respondents thought that changing the definition of lamb might help to reduce the impacts of substitution.

It is impossible to know exactly how much substitution is occurring in the industry because livestock numbers by age, source and destination are not known accurately enough to forensically deduce the volume.

In principal, substitution provides economic gains to those involved because it allows cheaper product to be acquired and sold as a more expensive product. The full value of lamb does not have to be realised in order to profit from substitution because the disparity between mutton prices and lamb prices is high. In that case if there is any impact on eating quality then customer dissatisfaction can be offset by price, still leaving high enough margins for those parties involved to profit from the practice.

The probable consequences of substitution are that it puts lower value product into a competitive market (because cost of production is substantially lower) which then puts downward pressure on other suppliers prices.

## **Cost of substitution**

The cost of substitution has been calculated at an assumed level of 5% (i.e. 5% of lamb is mutton that has been substituted for lamb). For every 5% of lamb that is substituted the cost to the industry is described below.

There are two components in calculating the cost of lamb for the industry. The first is the direct competitive advantage it affords the processor that substitutes mutton for lamb. The second is an indirect impact that the change in supply of lamb and mutton has on the price received by the rest of the industry.

The indirect effects of this behaviour are to:

- Decrease supplies of mutton for domestic and export markets and increase the price of mutton
- Increase supplies of lamb for domestic and export markets and decrease the price of lamb

The direct industry cost of substitution because of the competitive advantage it affords those processors that undertake the practice is calculated using key supply, demand, price and quantity parameters from the industry EDM as described previously. Total annual mutton production is 241 kilo tonnes, valued at \$1.75/kilogram or \$1750/tonne. Merino lamb is valued at \$2.47/kilogram, or \$2470/tonne.

Five percent substitution of 241 kilo tonnes of mutton is 12 kilo tonnes. The direct profit (and therefore competitive advantage accruing to those processors involved is 12,070 tonnes (2470-1750) \$/tonne = \$8.7 million per year.

The indirect impacts on producer or consumer behaviour depend on the elasticity values for supply and demand of mutton and lamb. According to the base elasticity values for the EDM detailed in Mounter et al. (2008a, Table 6), the own price elasticities of supply in the farm sector are very similar at around 1.0 (depending a bit on region), and the own price retail demand elasticities are very similar at around -1.5. There is a significant difference in the export demand elasticities, which are -2 for lamb and -5 for mutton, and in the cross price elasticities of retail demand, which are 0.1 for the effect of the price of mutton on the quantity of lamb consumed and 0.8 for the effect of the price of lamb on the quantity of mutton consumed.

Therefore adding 5% extra quantity to the lamb market will reduce prices in the first instance by about 3% per cent (weighted average of domestic and export demand responses); while

taking out 5% of quantity from the mutton market will raise prices by about 1.5% (weighted average of domestic and export demand responses). The lamb market is little impacted by changes in the price of mutton, so the 3% lamb price impact stands. Across the base quantities and prices of lamb (258 kilo tonnes of 1st and 2nd cross lambs @ \$3.58/kilogram; and 84kt of merino lamb @ \$2.47c/kilogram), the loss to the lamb industry totals \$27.7 million and \$6.2 million respectively.

The mutton market is moderately impacted by changes in the price of lamb (a 1% decrease in the price of lamb results in a 0.8% decrease in the quantity of mutton demanded). The expected 3% lamb price fall will therefore put downward pressure on mutton consumption and hence downward pressure on the price of mutton, estimated at 1%. Across the base price and quantity of mutton (241 kilo tonnes @ \$1.75c/kilogram), less the 5% already accounted for that is now lamb, the gain to the mutton industry totals \$4.0 million.

Overall then, in addition to the \$8.7 million per annum extra profit to traders who are selling mutton as lamb, there are substantial market consequences with a net loss in producer and consumer surplus of around \$30 million per annum. This loss will be eventually distributed across the various market segments, with specialist lamb and mutton consumers likely to gain, and mutton and lamb producers the losers.

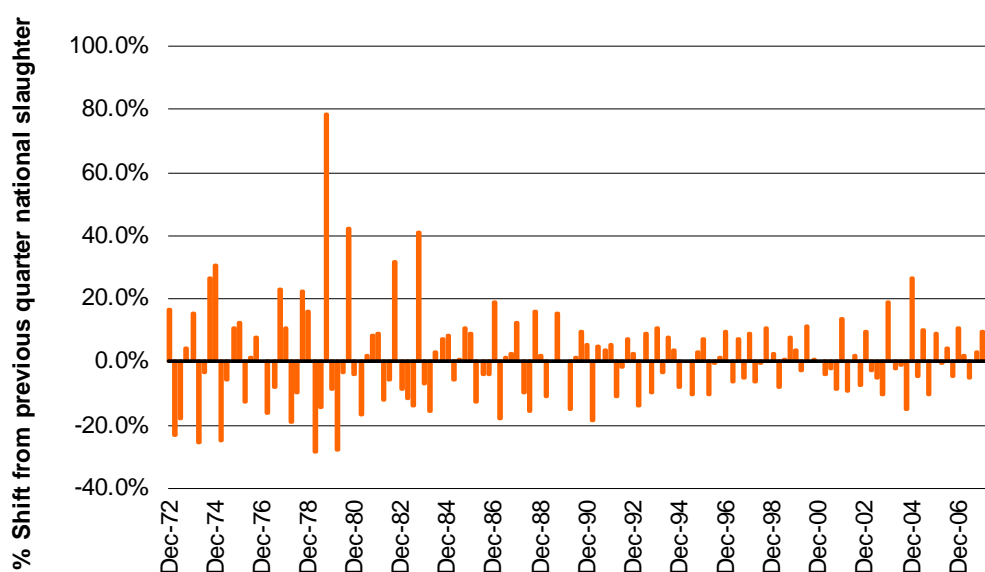
## **Seasonality of supply**

Australian Bureau of Statistics data (Graph 5) supports the claim that variability of supply from season to season has improved over time but it also suggests substantial variation in supply remains and that it is likely that for some sectors of the industry this would substantially impact their business.

Graph 5 shows the percentage change in each three month period from the previous three months. This graph shows that through the 1970's and early 1980's it was not atypical for there to be a 40% change from one three month period to the next with the average change over that period being 16%. Since the 1990's however this change from one three month period to the next has smoothed out and over that same period of time the change from one three month period to the next has fallen to average 6%.

At different times there is still significant volatility with the months of October through to December being a period of high supply and July through to September being a period of low supply.

**Graph 5: Seasonality of lamb supply has improved over time under the current definition however there remains an approximately 20% variation from highest to lowest slaughter numbers by quarter**



Source: ABS

The main determinant of supply patterns is producers who breed and finish the lambs. It is no accident that the months of high supply coincide with the main pasture growing season months in prime lamb producing areas because the cost of production at this time of the year is at its lowest.

Responses to the producer survey suggested that a change in definition of lamb would not on its own encourage them to change their supply patterns as;

1. A change to a two teeth not in wear definition would not lead to a change in breeding and production system (i.e. lambing dates or predominate sale dates) because the additional approximately 30 days is small and their production systems are set on a combination of pasture availability and quality and stocking rate and utilisation of the pasture that is grown as a key profit driver.
2. A change to a two teeth but no eruption of the third permanent tooth would not lead to a change in prime lamb and dual purpose production systems because it would be unable to be utilised profitably as the additional weight gained in that period would not outweigh the value of lambs weaned from running more ewes.
3. A change to a two teeth but no eruption of the third permanent tooth would not lead to a change in the timing of sales in wool production systems even though it is likely to lead to significant changes in production systems with altered flock structures (age of sale of wethers).

The onus is on the finisher to smooth out supply to processors because producers cannot see an incentive from a change in the definition of lamb to change when they supply product to the market. The incentive to supply out of season lambs for producers is driven by premium prices for out of season lamb to compensate for the higher cost of production.

Responses to the finisher surveys, and from producers who immediately thought that a change in definition to two teeth not in wear opened up lamb finishing opportunities to them, suggested that a change in definition to two teeth not in wear would allow additional animals to be finished as lamb.

It is therefore possible that changing the definition of lamb would help to smooth out supply if;

1. Finishers were prepared to buy and hold lambs for longer before putting them into the finishing systems.
2. Finishers were prepared to extend the period on feed to push supply from months of high supply to low supply.

In either case it will increase the cost of finishing lambs which means the finisher either has to be paid more by the processor to supply in that season or has to buy the lambs cheaper from the producer.

The impact this might have on smoothing out the existing supply of lamb which varies 20% by quarter is thought to be negligible given the minority of lambs that go through specialist finishing systems now (estimated to be less than 20%). Increasing the number of lambs that go through specialist finishing systems would require;

1. a premium for lambs that go through specialist grain finishing systems (as there is for beef that has been grain finished) over grass fed systems. A change in the definition of lamb does not deliver this.
2. for the cost of production for store lambs to be significantly lower than the cost of production for grass finished lambs so that it is economically preferable to supply the store market. It is unforeseeable how a change in the definition of lamb can deliver this outcome.

It is considered unlikely therefore that a change in the definition of lamb would significantly help smooth out supply of lamb. The best mechanism to do this would be to work on suitable pricing measures to account for increases in cost of production, and/or suitable strategies to allow store lamb cost of production to be low enough to account for the discounts received by finishers to grass finished product.



## Industry impact of a change in the definition of lamb

The industry impacts to changing the definition of lamb have been summarised from the industry modelling report written by Dr Garry Griffiths (NSW DPI) and Dr Stuart Mounter (UNE).

### *Extension to 'two teeth not in wear'*

The main benefit cited of an extension of the definition of lamb to two teeth not in wear was that lambs that currently erupt permanent teeth and therefore get down graded to mutton are unnecessarily reduced in price and therefore the producer or processor depending on who gets caught with the lamb loses income and profits.

Since the overall levels of lamb that erupt permanent teeth and therefore get downgraded to mutton are thought to be relatively small compared to the size of the various markets (0.6% in the non-merino lamb sector and 2% in the merino lamb sector), it is simpler to estimate the total cost to the industry of these lambs being downgraded to mutton rather than lamb.

The quantities involved are not thought to be sufficient to cause any substantive shift in the supply or demand curves to significantly change industry parameters even though individuals from within the industry might be significantly advantage because their production systems mean they are more exposed to this issue. Not accounting for producer supply response and consumer demand response will only result in small errors compared to a simple change in gross revenue approach.

Table 13 shows the estimated quantities of lamb that is downgraded to mutton based on survey responses.

**Table 13: 4.65% of potential lamb production is assumed to be downgraded to mutton.**

	% of industry affected	% of lambs at risk	% of lambs that cut teeth	% of total lambs
Specialist prime lamb	8%	20%	5%	0.08%
Dual purpose	7%	20%	5%	0.07%
Wool producers	20%	100%	5%	1.00%
<b>Lambs lost in breeding systems</b>				<b>1.15%</b>
Finishers	20%	50%	6%	0.60%
Processors	100%	100%	2.5%	2.50%
<b>Total</b>				<b>4.65%</b>

Given the base price and quantity data in the EDM, the aggregate loss from lamb being sold as mutton can be calculated as the aggregate quantity times the proportion of lamb involved in each sector times the per kg loss in value. The overall cost of the current practice is estimated to be just over \$20 million per year (Table 14).

Note that calculated loss per head for 2nd cross lamb (\$38.71) and 1st cross lamb (\$36.56) quite close to the current industry estimate of \$40 per head.

**Table 14: Losses of lamb to mutton are estimated to cost the industry \$20 million dollars per year.**

	Quantity (Kt)	% Lost	Loss if sold as mutton (\$/kg)	Aggregate loss (\$m)
Specialist prime lamb	121	0.08%	\$1.83	\$0.2
Dual purpose	137	0.07%	\$1.83	\$0.2
Merino lamb	84	1.00%	\$0.72	\$0.6
Finishers	342	0.60%	\$1.83	\$3.8
Processors	342	2.50%	\$1.83	\$15.6
<b>Total</b>	<b>342</b>	<b>3.40%</b>		<b>\$20.3</b>

The gain from changing the current lamb definition to add two teeth not in wear (around 30 days) would be essentially to offset all or part of the current losses from downgraded product when there is no evidence to suggest eating quality is substantially different.

It should be noted that not all of the industry would benefit from a change in the definition (i.e. the benefits would not be distributed evenly within each sector) as different production systems carry different levels of exposure.

There is some concern in the industry that an extension of the definition of lamb to two teeth not in wear would allow increased levels of substitution because the line between lamb and mutton becomes harder to distinguish (what is in wear and what is not). For every 5% level of substitution that currently occurs there is a direct benefit to the processor involved of \$8.7M and a net cost to the industry of \$30M from lower average price received.

Therefore, a change in the definition of lamb would only have to increase substitution by 3% offset any benefits to producers and processors of an extension to the definition of lamb.

### ***Extension to 'two teeth – before the eruption of third permanent tooth'***

The industry impacts from a change in the definition of lamb are estimated as reductions in the costs of lamb, mutton and wool production and are modelled as a vertical, parallel downward shift of the relevant supply curve. In each of the sheep enterprises in the model, the outputs of lamb, wool, mutton and live sheep exports are produced jointly by sharing a number of common inputs. The total cost of inputs for each individual sector is equal to the total revenue of its outputs.

The changes in cost of production and supply from the production systems modelling (Tables 2 to 6) are used to calculate the external impact on the equilibrium of the industry from a change in the definition of lamb.

The model calculates the net benefit/loss to the industry based on the industries existing flock structure. It does not attempt to address the issue of changing flock structures or enterprises on the basis of differentials in profitability between enterprises and flock structures. This may underestimate the impact of the change in definition; however it is assumed that because the Australian sheep flock is ewe dominant now the underestimation of the impacts will be small.

The potential economic surplus changes in millions of dollars and the percentage shares of the total surplus change accruing to the various industry sectors under the new definition of lamb are listed in Table 15.

The potential total annual economic surplus gains from the introduction of a new lamb definition without MSA investment (column 2) are estimated as \$79.15 million. Existing Merino ewe enterprises producing Merino lambs (<1yo) collectively gain \$6.74 million while Merino enterprises selling hoggets (<2yo) under the new definition receive \$22.89 million.

However, of these amounts, approximately \$1.5 million is generated at the expense of Merino ewe enterprises that produce first-cross lambs in the high rainfall and cereal-sheep zones where levels of production are reduced. Overall, sheep and wool producers receive a little over one third of the total benefits.

As the majority of Australian wool is exported, and wool exports increase, overseas consumers gain a large share of the additional industry returns (over 50 per cent).

Domestic consumers benefit from the lower retail prices for lamb and mutton, receiving around 2% of the total benefits. Domestic sheep meat processors (abattoirs) and retailers (butchers and supermarkets) share less than 3 per cent of the additional industry gains.

**Table 15: A 12.25% increase in processing costs to maintain eating quality would negate the benefits of a change in the definition.**

Market Segment	Extended lamb definition, no processor MSA costs		Extended lamb definition, includes processor MSA costs of 12.25%
	\$m	%	\$m
Producers of non-Merino ewes	\$0.2	0.2%	-\$5.1
Producers of Merino ewes producing non-Merino lambs (<1yo), HRZ	-\$0.5	-0.6%	-\$2.4
Producers of Merino ewes producing Merino lambs (<1yo), HRZ	\$2.3	2.9%	\$0.9
Producers of Merino ewes producing non-Merino lambs (<1yo), WSZ	-\$1.0	-1.3%	-\$4.7
Producers of Merino ewes producing Merino lambs (<1yo), WSZ	\$4.4	5.5%	-\$2.2
Producers of Merino ewes producing Merino lambs (<1yo), PZ	\$0.1	0.1%	-\$1.7
Producers of Merino wethers & hoggets, (<2yo), HRZ	\$6.3	8.0%	\$6.1
Producers of Merino wethers & hoggets, (<2yo), WSZ	\$16.0	20.2%	\$15.8
Producers of Merino wethers & hoggets, (<2yo), PZ	\$0.6	0.8%	-\$0.5
<b>Subtotal: All sheep and wool producers</b>	<b>\$28.3</b>	<b>35.8%</b>	<b>\$10.7</b>
Wool Processors	\$1.1	1.4%	\$0.8
Wool Exporters	\$1.5	1.8%	\$0.9
Sheep meat Processors	\$0.8	1.0%	-\$9.3
Sheep meat Exporters	\$0.1	0.1%	-\$0.1
Domestic Sheep meat Retailers	\$0.2	0.2%	-\$4.2
Overseas greasy wool consumers	\$31.5	39.8%	\$21.1
Overseas processed wool consumers	\$7.9	10.0%	\$5.4
Overseas lamb consumers	-\$0.0	-0.0%	-\$7.4
Overseas mutton consumers	\$1.2	1.6%	-\$0.4
Overseas live sheep consumers	\$4.9	6.2%	\$5.5
<b>Subtotal: all overseas consumers</b>	<b>\$45.6</b>	<b>57.6%</b>	<b>\$24.2</b>
Domestic Sheep meat Consumers	\$1.6	2.1%	-\$23.1
<b>Total Surplus</b>	<b>\$79.2</b>		<b>\$0.1</b>

To try and get a feel for a breakeven level of costs to implement a sheep meat MSA system, a range of simulations were done at different cost levels and a 12.25% increase in processing cost was found to produce an approximate breakeven for the industry as a whole (right hand column of Table 15). This would equate to about 12c/kg in increased processor costs per

kilogram. The sheep meat industry loses out at the expense of the wool industry, and sheep meat processors lose almost \$9.3 million while sheep and wool producers gain \$10.7 million.

The estimated cost of implementing MSA systems to protect eating quality as much as possible (there will still be an increase in consumer dissatisfaction from 5% for lamb less than 12 months of age to 15% for lamb between 1-2 years of age) is between \$0.02 and \$0.07 per kilogram. This increase in processing costs would therefore negate an estimated 35% of the benefits to the industry of a change in the definition of lamb.

Any increase in consumer dissatisfaction is likely to have a negative impact on demand for lamb. The required decrease in demand for lamb under the new definition to offset the residual benefit after increases in processing costs to minimise the impacts of eating quality is 2.5%. Any further decrease in demand would see a decrease in profitability of the sheep industry as a result of a change in the definition.

This result is recognised and supported by key customers and processors of which the vast majority did not want to see a change in the definition of lamb to two teeth but no visual sign of the eruption of a third permanent tooth.

Whilst a small net economic benefit has been found for the sheep industry of a change in the definition of lamb to two teeth but no visual sign of the eruption of a third permanent tooth. If this is weighted with the risks to eating quality and possible subsequent impacts there is no basis for a recommendation to change the definition of lamb to this new definition.

## **Appendix 1: Production system modelling methodology and assumptions**

All effects of changed production systems as a result of a change in definition are modelled at the margins; that is, the changes and impacts of the production system are considered and the effects incorporated into the model. Changes accounted for included:

- Flock structure and sale numbers
- Effect of flock structure on average fleece weights and fibre diameters.

Changes not accounted for include:

- Discounting of the benefits due to the time lag between the investments and achieving the returns were not allowed for due to relatively short time frame between the time of the investment and the likely benefit.
- Risk was also not accounted for. For example a major production risk is drought where an investment to increase lamb production as a component of total enterprise income may be made and by the time the benefits are realised, between 12-24 months later, drought may mean that additional sales need to be undertaken to manage the drought. These sales may be at a lower than average price. In such a scenario the investment may yield a lower return than estimated in these analyses. This is likely to be a larger risk in lower and/or more variable rainfall environments.

All parameters that were not directly affected by the change in enterprise structure were kept constant.

All effects in the production modelling stop at the farm gate. Therefore the impact of, for example, an increase in national lamb production and the effect of the increase in supply of meat on price is not taken into account. Similarly an increase in wool production and hence supply as a consequence of increased reproductive performance is not assumed to affect wool price. This approach is used because the principles investigated here are aimed at determining changes to cost of production. The changes in cost of production are then used in the industry modelling to determine changes in supply and price to get a net benefit/loss to the industry from a change in the definition of lamb.

Parameters for the modelled flocks in each production zone were based on the average parameters for the respective zone from the Holmes Sackett and Associates benchmarking database. The flocks modelled were:

- Self-replacing Merino flock (20-micron clip average) run in the high rainfall zone with five different flock structures and two lambing dates. Ewes were retained to five years.
- Self-replacing Merino flock (21-micron average) run in the sheep cereal zone with five different flock structures and two lambing dates as per the High Rainfall analyses.
- Self-replacing Merino flock (23-micron clip average) run in the pastoral zone with four different flock structures. These included selling wethers at weaning, one, two or three years of age. Lambing was in May
- Merino ewes joined to terminal sires in the high rainfall, sheep cereal and pastoral zones. Replacement ewes are purchased. This flock is described as a Dual Purpose flock throughout this report. Lambing was in July or August in the High Rainfall zone. This flock structure is used to loosely represent other dual purpose systems which include dual purpose breeds (e.g. SAMM).
- Prime lamb flocks purchasing Border Leicester x Merino cross ewes in the high rainfall and sheep cereal zone. This type of flock is described as a Prime Lamb flock throughout this report.

Details of the production characteristics of the systems analysed are shown in Table 16.

**Table 16: Production systems analysed for the impact of changed reproductive performance on economic performance of the flock**

	Age Wethers Sold	Main Month of lambing
<b>SR Merino</b>		
High Rainfall	<1yo, 1-2yo, 2-3yo, 3-4yo, 5yo	August & September
Sheep Cereal	<1yo, 1-2yo, 2-3yo, 3-4yo, 5yo	August & September
Pastoral	Weaning, 1-2yo & 2-3yo	May
<b>Dual Purpose</b>		
High Rainfall	<1yo	August
Sheep Cereal	<1yo	July
Pastoral	<1yo	April
<b>Prime Lamb</b>		
High Rainfall	<1yo	July
Sheep Cereal	<1yo	June

### **Price and cost assumptions in production systems modelling**

Prices used were based on historical prices which were adjusted for inflation using the consumer price index so that they represented prices in today's terms.

Wool prices were based on the ten-year median price between 1 July 1996 and 30 June 2006. These periods included a range of market conditions, from high to low levels, particularly for

the finer portion of the wool clip. The ten year period for wool was influenced by the latter period of the wool reserve price scheme (that ended in 1991), which artificially increased supply, and hence would almost certainly have depressed prices for the medium and broad wool categories that dominated the stock pile. Therefore, the use of price data from this period may overestimate or underestimate the economic effects of changed production systems to focus on lamb. Prices are shown in Table 17.

**Table 17: Ten year median wool prices, 1996–2006 (2006 dollars)**

Fibre diameter (micron)	10 year 35 Nktex (¢/kg clean)
16	1854
17	1504
18	1224
19	997
20	820
21	732
22	702
23	656
24	646
25	585
26	552
27	525
28	497
29	471
30	444

Source: Wood A. (2007) Independent Commodity Services, Wagga Wagga

Sheep prices for sales and purchases were based on the same period. Data were based on Meat & Livestock Australia livestock reports and opinion of the authors where there were no data for store sheep. Prices used are shown in Tables 18 to 20. As prices are medium to long term average, no account was taken for within year or seasonal variation in prices. This may result in some variation of the responses to changed flock structure because of the premiums and discounts that may apply throughout the year. The results for prime lamb enterprises are the most likely to be affected by this factor.

**Table 18: Ewe purchase price**

	10 Year Average
Prime lamb, 1 yo unjoined	\$70
Dual Purpose 3yo unjoined	\$40



**Table 19: Slaughter sheep prices 1996-2006**

	10 Year Average	Skin
Mutton	134c/kg Dwt	\$5
Merino Lamb	235c/kg Dwt	\$7
Crossbred Lamb	275c/kg Dwt	\$7

**Table 20: Ten year average store sheep and lamb prices**

	Sale Price				Rams	
	Weaners	1 yo Culls	Wethers	CFA Ewes	Sell	Purchase
<b>Prime Lamb</b>						
High Rainfall	\$56.14	-	-	\$38.77	\$50.00	\$600
Sheep Cereal	\$58.48	-	-	\$38.77	\$50.00	\$600
<b>Wool Flock</b>		\$30.93	\$36.69	\$33.81	\$50.00	\$600
<b>Dual Purpose</b>						
High Rainfall and Sheep Cereal	\$56.98	-	-	\$33.81	\$50.00	\$600
Pastoral	\$47.08	-	-	\$33.81	\$50.00	\$600

Enterprise costs were based on the nine-year average from Holmes Sackett & Associates farm benchmarking (McEachern et al 2007). This is a slightly different period than that used for prices but is the longest, most detailed data series available. These are the actual per-year costs (Table 21) incurred in sheep enterprises in a sample of over 100 farms. As these figures are the average over the nine year period, they are not adjusted for inflation.

**Table 21: Base unit costs and number of units utilised by each class of animal in the modelling**

	Unit cost	Number of units per annum					
		Breeding ewes	Dry ewes	Wethers	Rams	Weaners	1 yo
Shearing	\$4.42	1	1	1	1.6	1	1
Dipping	\$0.20	1	1	1	1	1	1
Crutching	\$0.95	1	1	1	1	1	1
Drenching	\$0.30	3	2	2	2	3	3
Vaccination	\$0.14	2	1	1	2	2	1
Jetting	\$0.30	1	0	0	1	1	1
Ear tags	\$0.30	0	0	0	0	0	0
Supplement (kg)	\$0.20	14	14	14	14	14	14
Mark/mules	\$0.80	0	0	0	0	1	0

Note: The Unit cost is the cost for one unit of the product, for example, one drench cost 30 cents per head. The number of units per annum is the number of times each of those units is applied to the respective class of sheep. For example breeding ewes are drenched three times and wethers twice. These costs will vary between farms, production systems and between years. However they are kept constant in these analyses because most of the major costs are the same for each system (e.g. shearing, crutching). Supplementary feeding costs are assumed to be constant across all classes in the base case scenarios. Again, this will differ widely between farms but is provided as base case.

Changes to profitability are measured through direct costs to get variations in gross margins whilst overhead costs such as general farm labour are kept constant in the analysis. Where minor changes in flock structure occur it is considered that these would not have a significant impact. Where major changes in flock structure occur such as moving from keeping wethers until 5 years of age it is likely that labour costs might change. In this analysis they have not been included.

Adjustments to the supplementary feeding expenses have been included for individual enterprises based on the number of dry sheep run through the autumn. Ewe dominant or winter lambing systems therefore have a lower supplementary feeding requirement than wether based systems because fewer sheep are run per hectare.

### **Stocking rate**

The underlying assumption in the model is that the winter carrying capacity sets the maximum number of sheep that can be run per hectare which in turn determines the gross margin per hectare.

The model therefore adjusts the number of sheep run per hectare in July according to:

- Livestock class (i.e. ewes, weaners, wethers, rams)
- Reproductive stage of the ewe (i.e. dry, pregnant, lactating)

The number of ewes run per hectare was adjusted for the conception rate or lambing percentage of the ewes if they are pregnant or lactating in July. This was done by adjusting the dry ewe demands by the absolute amounts shown in the tables below for the months during pregnancy, lactation and weaning (Table 22 and Table 23).

**Table 22: Additional feed demand per Merino ewe compared to dry ewe requirements according to conception rate, lactation status and number of lambs weaned**

Event	Month Post Lambing	Stocking Rate Adjustment/Lamb	
		Single	Twin
	-3	+0.1	+0.2
	-2	+0.2	+0.4
	-1	+0.6	+1.0
<b>Lambing</b>	1	+1.7	+2.0
	2	+1.8	+2.2
	3	+1.9	+2.3
<b>Weaning*</b>	4	+0.7	
	5	+0.8	
	6	+0.8	
	7	+0.8	
<b>Joining</b>	8	+0.9	
	9	+0.9	


\* Post weaning feed demand for twins and singles is assumed to be the same

 Effect on ewe

 Effect on lamb (post weaning)

**Table 23: Additional feed demand per Prime Lamb ewe compared to dry ewe requirements according to conception rate, lactation status and number of lambs weaned**

Event	Month post Lambing	Stocking Rate Adjustment/Lamb	
		Single	Twin
	-3	0.1	0.2
	-2	0.3	0.5
	-1	0.6	1.0
<b>Lambing</b>	1	1.8	2.2
	2	2.0	2.6
	3	2.1	2.3
<b>Weaning</b>	4	+0.7	
	5	+0.8	
	6	+0.8	
	7	+0.8	
<b>Joining</b>	8	+0.9	
	9	+0.9	

 Effect on ewe

 Effect on lamb (post weaning)

For example in a July lambing flock with 120% lambs weaned, the ewes would have a higher feed demand than dry ewes from a September lambing flock in July. The extra demand is calculated as per Table 24.

**Table 24: Average winter feed of a ewe July lambing flock rearing 120% lambs compared to a dry ewe flock**

	<b>Ewes Rearing Single Lambs</b>	<b>Ewes Rearing Twin Lambs</b>	<b>Whole flock</b>
Proportion of total ewes	80%	20%	100%
Additional feed demand compared to dry ewe (DSE/hd)	+1.7	+2.0	+1.8#

# weighted to the proportion of the flock in each category (80% at 1.7, 20% at 2.0)

Using the results shown in Table 24, a pasture that would carry 10 dry ewes per hectare will only carry 3.6 lactating ewes with 120% lambs ( $10 \div 2.8 = 3.6$ ).

The conception and survival rates were set by describing the phenotypic conception rate at 7 years of age which is assumed to be the peak level. This phenotypic level is then influenced by age structure so that after the peak conception rate for the ewe genotype is nominated it is then adjusted for age effects on conception and lamb survival rate. The adjustments are shown in Table 25 and Table 26. This is important due to changes in flock structure as a result of increased reproductive performance. Lamb survival rate for Merino x Merino lambs and Merino x Terminal rams were assumed to be the same. However they were assumed to have different weaning percentages in the base cases.

**Table 25: Effect of age of Merino ewe on conception and lamb survival rates compared to 7 yo ewes**

<b>Age at 1st Lamb</b>	<b>Ewe conception rate</b>	<b>Lamb survival rate</b>
1 yr	65%	60%
2 yr	80%	70%
3 yr	92%	75%
4 yr	95%	75%
5 yr	97%	75%
6 yr	99%	70%
7 yr	100%	70%
8 yr	99%	65%
9 yr	97%	65%

Note: for example 1 yo ewe has 65% of the conception rate of a 7 yo ewe. If 7 yo ewes average say 130% conception, the 1 yo ewes in the flock will have a conception rate of 84.5%

**Table 26: Effect of age of Merino x Border Leicester ewe on conception and lamb survival rate**

Age at 1 <sup>st</sup> Lamb	Ewe conception rate	Lamb survival rate
1 yr	65%	70%
2 yr	80%	80%
3 yr	92%	85%
4 yr	95%	85%
5 yr	97%	85%
6 yr	99%	80%
7 yr	100%	80%
8 yr	99%	75%
9 yr	97%	75%

### Other production parameters

The main production parameters, other than reproductive performance, that are adjusted for age and sex effects in the model are fleece weight and fibre diameter. A base phenotype for fibre diameter and fleece weight is described and then adjusted according to age and sex effects. The assumptions for the adjustments are shown in Table 27 to Table 29.

**Table 27: Effect of age and sex on clean fleece weight (4 year old wether = 1.0)**

	Age									
	0	1	2	3	4	5	6	7	8	9
<b>Ewes</b>	-	0.75	0.93	0.97	0.95	0.93	0.91	0.89	0.87	0.85
<b>Bred wethers</b>	0.26	0.70	0.98	1.02	1.00	0.98	0.96	0.94	0.92	0.90
<b>Purchased wethers</b>	0.26	0.70	0.98	1.02	1.00	0.98	0.96	0.94	0.92	0.90
<b>Rams</b>	-	0.98	1.37	1.43	1.40	1.37	1.35	1.33	1.31	1.29

**Table 28: Effect of pregnancy and lactation on clean fleece weight and fibre diameter**

	1 yo ewes	2 yo ewes	Mature ewes
<b>Effect on clean fleece (%)</b>	-11.0%	-12.5%	-15.0%
<b>Effect on fibre diameter (micron)</b>	-0.25u	-0.30u	-0.40u

**Table 29: Effect of age and sex on fibre diameter (4 year old wether = 1.0)**

	Age									
	0	1	2	3	4	5	6	7	8	9
<b>Ewes</b>	-	0.94	0.99	1.01	1.03	1.05	1.07	1.09	1.11	1.13
<b>Bred wethers</b>	0.85	0.93	0.98	1.00	1.02	1.04	1.06	1.08	1.10	1.12
<b>Purchased wethers</b>	0.85	0.93	0.98	1.00	1.02	1.04	1.06	1.08	1.10	1.12
<b>Rams</b>	0.90	1.00	1.03	1.06	1.08	1.10	1.12	1.14	1.16	1.18